COMPARISION OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA

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DECLARATION BY THE CANDIDATE

I hereby declare that the thesis entitled "**COMPARISION OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA**" submitted towards partial fulfillment of the requirements for the award of **MD in Anaesthesiology** degree to BFUHS is a compilation of original work carried out by me under the supervision of **Dr. Suneet Kant Kathuria**, Professor, Department of Anaesthesiology, **Dr. Shikha Gupta**, Professor, Department of Anaesthesiology, and **Dr. Parshotam Lal Gautam,** Professor & Head, Department of Critical Care Medicine. No part of this thesis has formed the basis for the award of any degree previously.

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Dedicated

to

my Family

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Teachers

LIST OF ABBREVIATIONS

BMI	Body Mass Index
COPD	Chronic Obstructive Lung Disease
DBP	Diastolic Blood pressure
EUS	Endoscopic Ultrasonography
ERCP	Endoscopic Retrograde Cholangiopancreatography
FRC	Functional Residual Capacity
FiO_2	Fraction of inspired oxygen concentration
HR	Heart Rate
HFNO	High Flow Nasal Oxygen
HFNT	High Flow Nasal Oxygen Therapy
HFNC	High Flow Nasal Cannula
ICU	Intensive Care Unit
MAP	Mean Arterial Pressure
SPO_2	Oxygen Saturation
SBP	Systolic Blood Pressure
STRIVE	SponTaneous Respiration using IntraVEnous anaesthesia
THRIVE	Transnasal Humidified Rapid Insuffalation Ventilatory Exchange
TIVA	Total Intravenous Anaesthesia

ABSTRACT

Introduction: High -flow nasal oxygen (HFNO) is relatively new technique that is being increasingly used in ICUs. Its role in operating room is successfully appearing in anaesthesia for minor airway surgeries and as an alternative method for pre-oxygenation. Its role in apnoeic oxygenation has also been highlighted in few studies. In anaesthesia practice oxygen is routinely supplemented to all patients regardless of depth of sedation being administered. Hypoxia is main concern in patients under sedation/ anaesthesia because of hypoventilation and airway obstruction. We hypothesize that the use HFNO as method of oxygenation in patients undergoing minor surgery would increase the margin of safety in patients with maintained spontaneous respiration under total intravenous anaesthesia (TIVA).

Aims & objectives: Our aim is to compare the effect of Venturi mask with high flow nasal cannula on oxygenation in patients undergoing minor surgery under total intravenous anaesthesia.

Materials & Methods: A randomized prospective study will be conducted on 100 patients of ASA I, II scheduled to undergo minor surgery under total intravenous anaesthesia. Patients will be randomly allocated into two groups. Group H will receive heated and humidified high flow nasal oxygen via AIRVO at a rate of 50-L/minute at FiO_2 0.5 and Group V will receive cold and dry low flow nasal oxygen via Venturi mask at the rate of 6 L/minutes.at FiO_2 0.5.

Clinical significance: This study will help us to find out the better way of oxygenation in non-intubated patients undergoing minor surgery under total intravenous anaesthesia.

Keywords: High Flow Nasal Cannula Venturi Mask

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INTRODUCTION

Day surgery has become a popular surgical intervention method all around the world. There are a number of characteristics that make day-care procedures appealing to surgeons, anesthesiologists, and patients alike. Fast paced life, relative shortage of hospital bed, scarce economic resources due to increasing patient population has boosted the concept of day care surgeries. Advancement in anesthetic techniques, introduction of newer, safer devices and better understanding of pharmacokinetics and pharmacodynamics of anesthetic drugs has made these day care surgeries possible, popular and safer.[1]

One such technique is TIVA, total intravenous anesthesia which includes induction and maintenance of anesthesia using only intravenous drugs with or without maintenance of spontaneous respiration. This technique has revolutionized the day care surgery. Minor gynecological, urological, endoscopic and some other procedures, which require only mild to moderate levels of sedation can be performed under TIVA with the maintenance of spontaneous respiration which is also termed as STRIVE(SponTaneous Respiration using IntraVEnous anesthesia).[2, 3]

Most widely used drug for induction of TIVA for day care surgery is propofol owing to its favorable profile which is quick onset of action and rapid, reliable recovery.[4]The short context sensitive half-time, with short effect-site equilibration time makes this a readily titratable drug for iv sedation. Propofol is non-barbiturate sedative-hypnotic agent, possess amnesic, anticonvulsant, anti-emetic property and at times may have anti-nociceptive properties due to suppression of cortical activity and responsiveness. Since it lacks analgesic properties, propofol can’t be used as a sole anesthetic agent for any stimulating procedures.[5]

It can be combined with another suitable drugs like Ketamine and opioid analgesics such as Fentanyl.[6]Ketamine is a neuroleptic anesthetic agent which works on thalamocortical and limbic NMDA

receptors, increases heart rate and blood pressure(sympathomimetic effect).[7]

Combination of these two drugs has several advantages, ensures administration of small doses of each, and thus prevents adverse effects.[8, 9] With the use of intravenous anesthesia even at mild to moderate depth of anesthesia, there is always risk of upper airway obstruction due to relaxation of the upper airway muscles[10] and hypoventilation if patient reach to level of deep sedation.[11]Patel et al reported that 85% of ERCP, 45% of colonoscopy 80% EUS experience episodes of deep sedation even when procedure was done with intent of moderate sedation.[12]

Studies have shown that even deep sedation/anesthesia reduces functional reduces capacity (FRC) even with preserved spontaneous breathing. Functional residual capacity is the most important oxygen store in the body. The greater the FRC, the longer the apnea can be tolerated before critical hypoxia develops. The alveolar fraction (FAO_2) is about 0.13 when breathing air. For an adult with a normal FRC and VO_2 (volume of oxygen), the oxygen content will be used within ~1 minute(290 ml). This explains why critical hypoxia can be expected after 1 minute of apnea. Patients with reduced FRC (not uncommon under deep sedation) reach critical hypoxia more rapidly. There is decrease in minute ventilation (MV) as a result of decrease in respiratory rate or tidal volume or both, causing carbon dioxide retention.[13]Hypoventilation leading to hypercapnia causes hemodynamic abnormalities such as abnormal increase in blood pressure, tachycardia, and arrhythmia. [10] Respiratory complications that occur during intravenous sedation have a higher risk of hypoxemia and hypercapnia.[14]

So, maintaining patent airway, avoidance of hypoxemia and hypoventilation becomes a key challenge while performing these procedural sedations. Maintaining oxygenation becomes more important in the patients having difficult airway. Clemens et al in retrospective cohort of 2937 procedures, studied the major complication associated with moderate to deep sedation. He found that

significant desaturation is one of the common events associated with analgo-sedation. In his study he found 1.6% showed significant desaturation and 0.6% showed severe desaturation. Higher BMI was a risk factor of desaturation.[15]

The current standard method of performing minor surgeries under STRIVE involves use of venturi masks, face masks, or supraglottic devices.[16]These methods render patients either vulnerable to desaturation or may lead to use of unnecessary more invasive methods of airway management.[17] With the advent of concept of THRIVE(Trans nasal Humidification Rapid Insufflation Ventilatory Exchange) airway can be better managed without the use of invasive methods.[18] In 2013 Patel et al introduced warmed and humidified high flow oxygen delivery oxygen delivery using OptiFlow system aiming better way of oxygenating patients. They found not only increase in apnea time based on “apneic oxygenation” but also found that carbon dioxide was also being cleared and rate of rise of CO2 was only 1/3 of what was expected. This suggested a physiology supplementing classical apneic oxygenation was driving ventilation without ventilation movements i.e., “apneic ventilation”.[19] With THRIVE, ventilation occurs with a non-invasive nasal cannula rather than tracheal. In literature different terms has been used for THRIVE such as HFNO(High Flow Nasal Oxygen),HFNT (flow nasal oxygen therapy),HFNC (High flow nasal cannula).The High flow nasal cannula (HFNO) is an innovative system that allows for delivering up to 60 litres min^{-1} of heated and fully humidified gas with a FiO_2 ranging from 21% to 100%. This high flow nasal oxygen is delivered using OptiFlow THRIVE device which has specially made circuit system and high flow nasal cannula(HFNC), allows controlled oxygen concentrations and low levels of positive airway pressure[20, 21].

Recent trials conducted in Intensive Care Units (ICU) and other clinical settings like endoscopy suits indicate that compared with conventional oxygen therapy, HFNO achieves better oxygenation as well as better patient comfort. But role of HFNO in operating room settings has not yet been explored much. In our study we aim to expand usage of

HFNC in operating room so we compare effects of HFNC and venturi mask on oxygenation, incidence of hypoxia, hemodynamic stability in patients under STRIVE/TIVA.

AIMS AND OBJECTIVES

Comparison of Oxygenation using venturimask and High Flow Nasal cannula in patients undergoing minor surgery under TIVA in terms of:

Incidence of hypoxia (SpO_2< 90%)

Haemodynamic instability (>20% fluctuation from baseline HR/BP)

Need for airway manoeuvres/adjuncts

Need for supra-glottic airway device insertion

Patient's tolerance of procedure

REVIEW OF LITERATURE

Minor/ambulatory surgeries have expanded far beyond performing the simple procedures on healthy patients. Currently, a broad range of procedures are performed in patients who frequently have pre-existing medical conditions.[22] Minor surgery requires the same basic standards as inpatient major surgery in terms of facilities required, perioperative monitoring, anaesthetic management and resuscitation. The choice of anaesthetic drugs and technique should enable appropriate and controllable intraoperative conditions. General anaesthesia commonly remains the most popular technique among patients, surgeons and anaesthesiologists. Patients undergoing minor to intermediate surgery using a TIVA technique may sometimes receive oxygen through a simple Hudson-type face mask.

This method of oxygen supplementation may not be sufficient to prevent hypoxia.

Moreover, cold and dry oxygen is intolerable to patients. The depth of sedation required during minor/ambulatory procedures is almost similar to general anaesthesia and, airway remain largely unprotected. So oxygenation and maintaining airway is the key role of anaesthesiologists while performing these procedures.

Oxygen delivery devices can be classified into low flow or variable performance and high flow or fixed performance devices.

LOW FLOW OXYGEN DELIVERY SYSTEMS

These are variable performance devices, i.e. their performance gets changed with the changes in patient's respiratory parameters. As their output varies, they are less accurate and less reliable in terms of oxygen delivery. The rate and depth of breathing determines the oxygen concentration (FiO_2) and is mostly not fixed. Fast and deep breathing results into lower FiO_2 because it draws more room air into lungs and thus dilutes the inspiratory gases and oxygen concentration.[23] Low flow oxygen delivery devices include:

Nasal Cannula

Simple Mask

Partial Rebreather Mask

Non – Rebreather Mask

HIGH FLOW OXYGEN DELIVERY DEVICES

High flow oxygen delivery devices will provide a fixed FiO_2 (0.24-1.0) regardless of the patients/client's inspiratory demands. Examples of high flow devices include:

Air entrainment mask (Venturi - mask)

Air entrainment nebulizer

Nasal High flow oxygen therapy

Mechanical ventilators

VENTURI MASK: The Venturi mask is commonly used for oxygen delivery. Oxygen is delivered at high velocity through a small orifice, and the shear forces lead to mixing of room air.[24] FiO_2 can be adjusted using adjustable mask adopters by varying its different orifice size. The flow of gas delivered to the patient always exceeds minute ventilation, which prevents entrainment of room air around the mask and dilution of oxygen. To increase FiO_2 flow rates has to be increased and maximumFiO_2 that can be delivered is 0.5 with flow rate of 6L/min. The humidification of inhaled gas remains problematic which limits the use of these devices for prolonged period of time.[25]

HIGH FLOW NASAL OXYGEN THERAPY(HFNT)

Devices that offer high flows of totally humidified gases(37 degree C, 100% relative humidity,44mmHgH2O/L from 20L to 60L/min through specific nasal cannula are commonly called HFNT(High flow nasal oxygen therapy)systems. A heated humidifier connected to a heated insulated single limb circuit provides active humidification.[20, 26](picture 1 shows the schematic presentation of HFNC and its parts.[26]

It is an innovative high flow system that allows for delivering up to 60Litres/min of heated and humidified gas with FiO_2 ranging between 21%-100%. FiO_2 adjustments are independent of the setting flow rate, which is set above the patient's maximum inspiratory flow rate, to administer heated and humidified high flow oxygen to the patients.[20,27,28,29]

Several mechanisms explain how HFNT is better oxygenation method and how it improves arterial blood gases and patient's comfort as well.[27,26,29]

FiO2 levels, which are more steady and greater when delivered via HFNC than traditional oxygen delivery methods, are essential for maintaining oxygenation. As oxygen is usually supplied by facial masks or nasal prongs at a flow of less than 15 litres per minute, FiO2 levels in patients with high inspiratory flows and respiratory rates are unstable. HFNT may sustain high FiO2 by limiting air entrainment and applying high flow rates above a patient's inspiratory requirements.[20,30]

High flow rates generating PEEP like mechanisms

These high flow rates create a positive airway pressure which linearly correlates with the administered flow rate.[31] For every 10L/min increase in gas flow, the mean airway pressure increases by 0.69cm H2O in the mouth closed position and 0.35 cm H2O in the mouth open position. Analysis of pressure generated during different parts of respiratory cycles demonstrated that higher pressure is generated during expiration than inspiration, which is flow dependent. This mechanism resembles application of PEEP and it causes recruitment of atelectatic areas and thus increases the end expiratory lung volume by ~ 25%. Lung compliance increases and patient breathes more slowly, with almost 10% higher tidal volumes and lower respiratory rates.[28,32,33] Amy H Attaway et al conducted interventional prospective study from October 2016 to June 2017 in Cleveland, Ohio, recruited patients COPD from pulmonary clinic. They applied HFNC to well characterized severe COPD patients in both hypercapnic and normocapnic subjects and monitored PCO2 levels in arterial blood gas sample. They found significant reduction in CO2 levels and as well as in respiratory rates. CO2 levels reduced from mean of 49.5- 13.1mm Hg to 47.2+14.1mm Hg and respiratory rates decreased from 19.3+0.94 to 16.7+1.5 breaths/min.[34]

It is important to stress that HFNT does not provide CPAP.[34] Although the pressure inside the pharynx may be lower than during CPAP because the interface used during HFNT is not tightly fitted to the

nostrils,[35] this pressure may be sufficient to increase the end-expiratory lung volume (EELV).[36] HFNO is associated with the generation of positive airway pressure that ranges from 2.7 and 7.4cm of H2O.[37]

Rachel L parke et al measured air way pressure (which was measured at hypopharynx) and end expiratory lung impedance in healthy volunteers and found 2.7+-0.7 to 11.9+-2.7 cm H2O pressure is produced when subjects are advised to breath with close mouth and a cumulative linear increase in end expiratory lung impedance and end expiratory lung volume. They also found positive linear relationship between delivered gas flow and airway pressure measured. For every 10l/min increase in flows there is increase in pressure by 1.16 cm of H2O and at the highest flow of 100l/min the mean airway pressure measured was 11.9+-2.7 cm H20.[21,38]

Reduction of inspiratory resistance[26]

During inspiration, the negative pressure is generated by the respiratory muscles which may cause retraction of nasopharyngeal muscles and thus increases the airway pressures. HFNC can reduce this by following mechanisms

a) Meeting and exceeding the patients peak inspiratory flow by providing high flows
b) “splinting” the nostrils by activating nasal muscles
c) Reducing bronchoconstriction.
d) Improvement in muco-ciliary clearance

Practice guidelines recommend conditioning of oxygen when delivery exceeds 4l/min which is not possible using conventional oxygen therapy devices.Dry air breathing results in excessive water loss by the nasal mucosa, which may in turn reduce nasal muco-ciliary clearance rate through changes in the rheological properties or adhesiveness of nasal mucus and/or slowing of ciliary beating[39] HFNC improves the humidification of inspired gases to decrease the symptoms of dryness, eventually improve comfort and muco-ciliary clearance.[40,41]

Nasopharyngeal dead space washout

The nasopharyngeal dead space contributes to the heating and optimal humidification of the inspired air but at the same time also encloses end expiratory gases thus decreases the efficiency of gas exchange. By reducing the dead space inside the nasopharynx via the insufflation of fresh gas, HFNT decreases the overall dead space and improves alveolar ventilation.[42, 43] In a bench study, it was observed that HFNT, delivered at 30 L/min, eliminated CO_2 contained in the dead space of the nose model during the very beginning of expiration and swapped it with fresh air.[43]

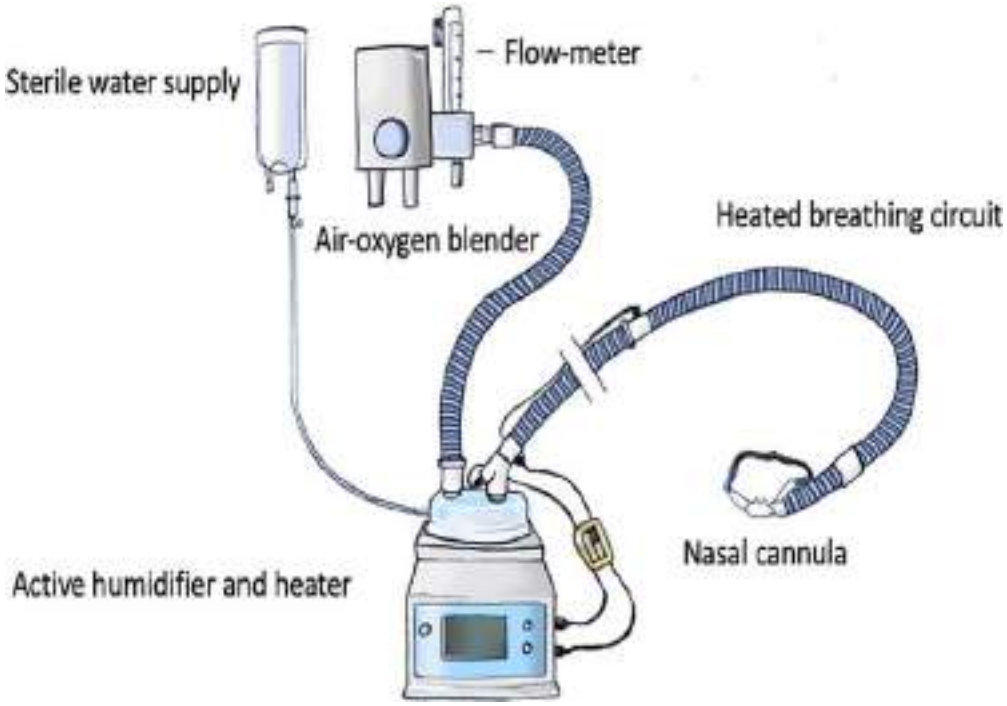
Interestingly, although HFNT is often termed high flow oxygen therapy, most of its beneficial effects can be achieved at FiO_2 0.21, as observed during CPAP.

Flow and FiO_2 should be titrated separately during HFNT application. FiO_2 titration is important in patients with COPD because over-oxygenation may cause hypercapnia.

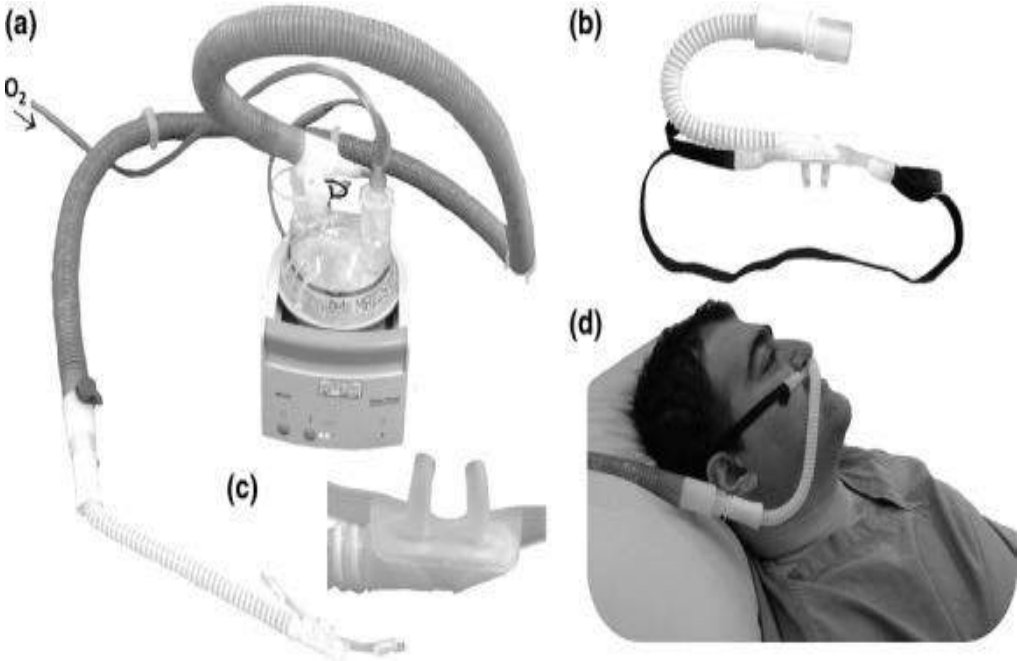
Flow should be set as high as possible, up to 60 L/min, to match the patient's inspiratory flow.[44] Temperature is also a very important issue. HFNT temperature seems to significantly impact the comfort of patients with hypoxemic ARF. Mauri et al. found that, for unchanged flow, controlling temperature seemed to be associated with better comfort.[45]

Less metabolic cost for gas conditioning

Inspired air is heated to 37 degree C and humidified to 100% Relative Humidity[46] during normal breathing. This process involves metabolic energy expenditure which can be reduced by HFNC.[47] Theoretically, each litre of inspired air requires 10.75 joules to increase the temperature and humidity of room air. A normal adult breathing tidal volume of 500 ml at a respiratory rate of 12/minute requires approximately 156 calorie/min for the heating and humidifying of inspired gas. This metabolic cost is higher in patients with acute respiratory failure who are breathing at higher rates and thus these patients are prone to easy fatiguability which can be avoided using HFNC.[47,48]



Picture 1: Schematic presentation of High Flow Oxygen Device And its parts[26]



Picture 2: (a) oxygen humidification unit, (b) & (c) receives oxygen from a standard oxygen regulator and delivers humidified oxygen to a custom-built transnasal oxygen cannula (d) standard nasal oxygen cannula.[18]

Picture 3: Airvo Nasal high flow system[18]

Studies comparing the effects of HFNC and other oxygen delivery deviceson varieties of patients and in different clinical settings show variable results.

.Jean-Luc Hanouz et al in 2019 conducted a study comparing High flow nasal oxygen for preoxygenation against face mask in operating room.They found that the ETO2 after 3 min of pre-oxygenation was 89 (2) % and 77 (12) % in the face mask and HFNO groups respectively thus conclude that pre oxygenation with HFNO is not a reliable method of pre-oxygenation before induction of anaesthesia.[49]

Lu Z et al in 2019 represented a meta-analysis of the effect of high - flow nasal cannula (HFNC) oxygen therapy compared with conventional oxygen therapy in post-operative patients and concluded that HFNC significantly reduced the reintubation rate and rate of escalation of respiratory support in post-extubated surgical patients

compared with conventional oxygen therapy, which proves better oxygenation capacity of HFNO.[50]

Roman et al conducted a retrospective study on 238 patients undergoing ERCP(Endoscopic retrograde cholangiopancreatography) and EUS(Endoscopic ultrasound).They concluded that high flow nasal oxygen availability was associated with improved oxygenation and decrease utilization of general anaesthesia.[51]

Lin Y et al in 2019 conducted study on 1994 outpatients undergoing routine gastroscopy with propofol sedation and concluded HFNC oxygen therapy decreased the incidence of hypoxia(75%< spo2 <90%) from 8.4% to 0% and incidence of severe hypoxia (spo2<75%) from 0.6% to 0%. They reported only HFNC-related adverse event was, xeromycteria/rhinalgia which was reported 1 minute after the start of procedure and disappeared after 30 minutes.[52]

Chong et al in 2017 conducted retrospective study in patients <24months of age with bronchiolitis admitted in ICU, observed that humidified high flow nasal cannula oxygen reduced intubation rates from 22% to 7.8%.[53]

A Patel et al between 2013 -2014 conducted a study on 25 patients and used HFNC to increase apnea time with difficult airways undergoing hypopharyngeal and laryngotracheal surgery. They concluded that apnea time was increased to mean value of 14 minutes and none of the subjects experienced arterial desaturation (SpO_2<90%). In this study, they observed a patient on BMI 34Kg/m^2 with acute airway compromise desaturated to 92% only after 7 minutes of induction which was likely to happen sooner in absence of HFNC.[18]

Kyung et al in a prospective observational study found effect of high flow nasal Cannula (HFNC) in patients with mild to moderate hypercapnia. They observed there was a significant decrease in PaCO2 in first hour of HFNC application, correction in arterial pH, but no significant improvement in respiratory rate, bicarbonate levels and arterial partial pressure/fraction of inspired oxygen ratio.[54]

Yanli wang et al presented a systematic review and meta-analysis of comparison of HFNC and conventional oxygen therapy (COT) in obese

patients undergoing cardiac surgery. They included 3RCTS and enrolled a total of 526 patients, and concluded that for obese patients HFNC can be used postoperatively as an oxygenation method, however as compared with COT there was no significant difference in terms of atelectasis score 24hr postoperatively, dyspnea score, reintubation rates and ICU length of stay.[55]

Benjamin et al conducted a prospective study among ICU patients with acute respiratory failure observing the effect of high flow nasal oxygen therapy in comparison with conventional oxygen therapy. They compared clinical respiratory parameters and arterial blood gases and found that use of HFNC enabled significant reduction in respiratory rate from 28 to 24.5breaths per minute, a significant increase in arterial oxygen saturation as measured by pulse oximetry from 93.5% to 98.5%, and also increased PaO2 from 8.73Kpa to 15.27Kpa.

They concluded use of HFNC in persistent ARF was associated with significant improvement of both clinical and biologic parameters.[56]

N Douglas et al carried out a randomized control trial comparing high flow nasal oxygen with standard management for conscious sedation during bronchoscopy.

They found out 4 out of 30 patients desaturated in HFNC group and 10 out of 30 patients desaturated in conventional group. This result was not statistical significant but do represent an absolute risk reduction of 21%, a relative risk reduction of 40%.There were no difference in secondary outcomes (hemodynamic parameters)[57]

Conway et al conducted a RCT comparing HFNC and face mask during procedural sedation for cardiac implantable device. They measured peak transcutaneous carbon dioxide levels and concluded there was no significant difference in these two groups.[58]

Shih et al conducted a RCT comparing the effect of high flow oxygen and conventional face mask during prolonged deep sedation on the post procedural atelectasis. Changes in the areas of lung atelectasis calculated on the basis of chest CT images and also compared recovery profiles were compared. They concluded that HFNC group exhibit less postprocedural atelectasis than face mask group.[59]

Chong et al conducted retrospective study on pediatric patients <24 months of age with a diagnosis of bronchiolitis and observed that in HFNC group there is reduction in intubation rates i.e. from 22% in 2008 to 7.8% in 2013 but there was no significant improvement in ICU admission rates.[53]

Liu F et al in 2019 evaluated whether high flow nasal oxygen therapy speed weaning from mechanical ventilation by doing prospective randomized control trial on 268 patients and found out that HFNC reduce the time needed to wean patients from mechanical ventilation by shortening needed to pass a spontaneous breathing trial and by decreasing the re-intubation trial.[60]

Both et al conducted a retrospective observational study using SponTaneous Respiration using IntraVEnous anaesthesia and High flow nasal oxygen(STRIVE Hi).He concluded 26 patients(86%) presented with significant airway and/or respiratory compromise. No episodes of apnea or complete airway obstruction occurred during the induction of anaesthesia using STRIVE Hi. The median lowest oxygen saturation occurred during induction period was 100%. The median overall duration of spontaneous ventilation was 44 minutes. The median end tidal carbon dioxide level at the end of spontaneous ventilation was 6.8 Kpa. STRIVE Hi succeeded in preserving adequate oxygen saturation, end tidal carbon dioxide and airway patency.[2]

Chan lee et al did a case series on 3 obese patients undergoing colonoscopy under propofol sedation. They found minimum oxygen saturation was 88%,98%,91% in patient 1, patient 2,patient 3 respectively. Only patient 1 required airway maneuver (jaw thrust) and none of them required any supraglottic device or tracheal intubation.[61]

JG Saslow et al. conducted a study on 18 preterm neonates to compare the work of breathing in HFNC with nasal continuous positive airway pressure (NCPAP). They concluded that there was no difference in work of breathing in both groups, therefore according to their observations support provided by HFNC was comparable to NCPAP.[62]

Dysart Kevin et al conducted a study on neonates to test the trial of an early extubation protocol. They concluded that infants extubated to High flow oxygen therapy(HFT), compared to other non-invasive support modes, showed that respiratory rate decreased immediately following initiation of HFT(63-68 breaths/ minute) with a sustained decrease in heart rate (175-144 beats/minute) after a short period.[63]

High Flow nasal cannula (HFNC)is representative of next generation oxygen device that carries unique advantage in augmenting respiratory function along with oxygenation. It has great potential for utilisation in procedures requiring analgo-sedation. Not much evidence is available regarding use of HFNC; further studies are needed to determine the specific population that will benefit from HFNC while receiving intravenous propofol sedation and in comparison with conventional oxygen therapy. This study aims to find the same.

MATERIAL AND METHOD

SOURCE OF DATA

A randomised observational study was conducted in the Department of Anaesthesiology, DMC& H, Ludhiana, after approval from institutional ethics committee on a total of 100 patients undergoing minor surgery. Patients were randomly allocated in two groups of 50 patients each, by computer generated randomisation codes contained in sealed, sequentially numbered envelopes. A written informed consent was obtained from each patient.

METHOD OF COLLECTION OF DATA

A total of 100 patients of ASA physical status I & II, scheduled to undergo minor surgery were taken up for this study.

Group allocation:

Patient was randomly allocated to either of two groups of 50 patients each, based on computer generated random numbers.

GROUP H: comprising of 50 patients, received high flow nasal oxygen using AIRVO at the rate of 50L/minute at 0.5 FiO_2.

GROUP V: comprising of 50 patients, received oxygen via Venturi mask at the rate of 6L/minute at 0.5 FiO_2.

Inclusion criteria

Age=>18yrs

ASA I & II

Patients with BMI <40kg/m^2

Patients undergoing elective minor surgeries

Exclusion criteria

Morbid obese patients (BMI>40kg/m^2)

Patients having pre procedure saturation <90%

Peripheral vascular disease

Psychiatric / neurological diseases

Allergy to drugs used in general anaesthesia

Severe renal, hepatic, cardiac and respiratory diseases

Patients with anatomical facial/nasal/airway abnormality/trauma

Patients' refusal of consent

ANAESTHESIA TECHNIQUE

Pre anaesthetic examination comprising of detailed history, physical, systemic examination and routine base line preoperative investigations, was done in every case. A detailed preoperative airway assessment was done including mouth opening, neck movements, presence of buck teeth, thyro-mental distance and Mallampati grading to anticipate difficult airway. Informed consent was obtained from each patient prior to the start of the procedure using approved anaesthesia consent form.

All the patients were kept nil per orally for at least 6 hours prior to procedure. On shifting patient in the operating room, standard of care monitoring of vital signs using multi- parameter patient monitoring including pulse-oximetry, heart rate, non-invasive brood pressure measurement and continuous ECG monitoring, was started and base line values were recorded. Intravenous access was secured. Patients were pre oxygenated for 3 minutes using venturi mask or high frow nasal cannula according to allocated 'groups'. Patients were premedicated with inj. glycopyrrorate 0.2mgiv, Inj. ondansetron 4mg iv and iv fentanyl citrate 2 mcg/kg bodyweight and midazolam 1mg intravenously.

Anaesthesia was induced using a mixture of ketamine and propofol (Ketofol solution). This ketofol solution was prepared using ketamine and propofol in ratio of 1:2 i.e., 2 ml (100 mg) of ketamine added to 20 ml (200mg) of 1% propofol, making total of22 ml, such that 1 ml of this ketofol contains 4.55 mg of ketamine and 9.09 mg of propofol. Loading dose of inj. Ketofol (0.2ml/kg body weight) was given intravenous slowly, titrated to the loss of response to verbal commands. Oxygenation was continued throughout the procedure using venturi mask or high frow nasal cannula respectively as per group allocation.

Anaesthesia was maintained by using intermittent boluses of 2-3 ml of ketofol solution. Additional fentanyl boluses (0.5 microgram/kg) was given to maintain analgesia if patient develops signs of inadequate analgesia (tachycardia, hypertension, diaphoresis, tachypnoea and patient movement). Continuous monitoring of SpO_2, ECG, Heart rate,

non-invasive blood pressure monitoring was displayed and parameters were recorded every 5 minutes during the course of the procedure. Total duration of procedure and total consumption of propofol, ketamine and fentanyl were noted. Number of episodes of hypoxaemia (i.e., SpO_2 less than 90%) were recorded.

At any time during the procedure, if oxygen saturation fell below 90%and/or airway obstruction was suspected, airway support manoeuvres, such as performance of chin lifts or jaw thrusts was done to open the obstructed airway. lf oxygen saturation still remained<90% or airway obstruction persisted, oral/nasal airway was inserted. If patient developed apnoea, bag and mask ventilation with 100% oxygen was started. If there was difficulty in maintaining patent airway or if there was a difficulty in bag and mask ventilation, supraglottic device insertion or intubation was done as appropriate. Propofol-induced cardiac depression (hypotension and/or bradycardia) was appropriately treated with incremental doses of inj. ephedrine and /or atropine.

At the end of procedure, full recovery from anaesthesia was ensured by spontaneously breathing patient, stable haemodynamic, responding to verbal command and sustained head lift. Patients were then shifted to post anaesthesia care unit and vital parameters were recorded every 10 minutes for next two hour. When patient met discharge criteria (Modified Aldrete score > 9), he/she was allowed to be shifted from recovery room to ward.

Patient response for procedural comfort and satisfaction was dichotomized to favourable (Excellent = 5, Very good = 4, Good = 3)and unfavourable (Fair = 2, Poor = 1).

OUTCOME

Primary outcome

Incidence of hypoxia (SpO_2< 90%)

Secondary outcomes

Haemodynamic instability (>20% fluctuation from baseline HR/BP)

Need for airway manoeuvres/adjuncts

Need for supra-glottic airway device insertion

Patients tolerance of procedure

Statistical Analysis

A post hoc power analysis was conducted using the software package, G Power (Faul and Erdfelder 1992). The alpha level used for this analysis was $p<0.05$ and beta was 0.20. If the post hoc analysis reveals the statistical power of 0.40, it detects a small effect size, whereas if the power exceeds 0.80 it detects moderate to large effect size. By using the parameter oxygen saturation with reference to study. Schumann R, Natov NS, Rocuts-Martinez KA, Finkelman MD, Phan TV, Hegde SR, et al. High-flow nasal oxygen availability for sedation decreases the use of general anesthesia during endoscopic retrograde cholangiopancreatography and endoscopic ultrasound. World J Gastroenterol. 2016;22:10398–405, which was the primary outcome of our study, Power of the study has been calculated to be 0.93 and with an effect size of 0.37 with 10% chance of error for total sample size 100 i.e. 50 each.

OBSERVATION AND RESULTS

Table 1: Comparison of study groups according to age.

GROUP	RANGE	MEAN	STANDARD DEVIATION	P value
H	18 – 52	36.32	7.73	0.403
V	20 – 53	33.22	8.18	

Patients in two groups were comparable demographically. The mean age of patients who received oxygen via HFNC was 36.32±7.73and in the venturi mask group it was 33.32±8.18.

There was no statistical difference in the age distribution among two groups.($p>0.05$)

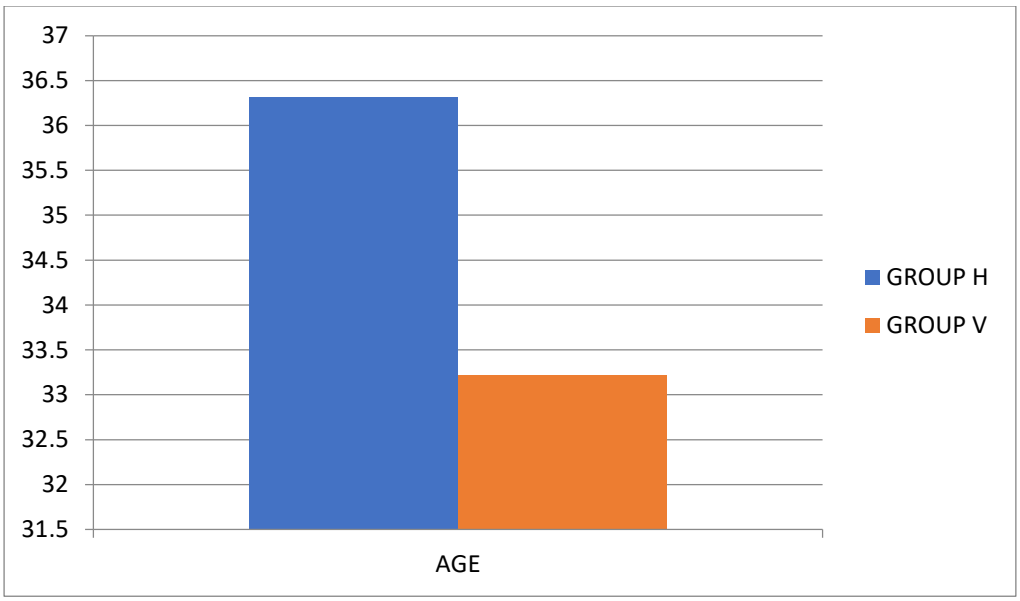


Figure 1: Comparison of study groups according to age.

Table 2: Comparison of study groups according to gender distribution.

		Group H		Group V		Total	Chi-square value	p-value
		No. of cases	%	No. of cases	%			
GENDER	F	38	76%	45	90%	83	3.473	0.108
	M	12	24%	5	10%	17		

Group H comprises 12% male and 38% female, while group V had 5% male and 45% female, difference was statistically insignificant as p>0.05. Both, groups were demographically similar and comparable in terms of age and gender.

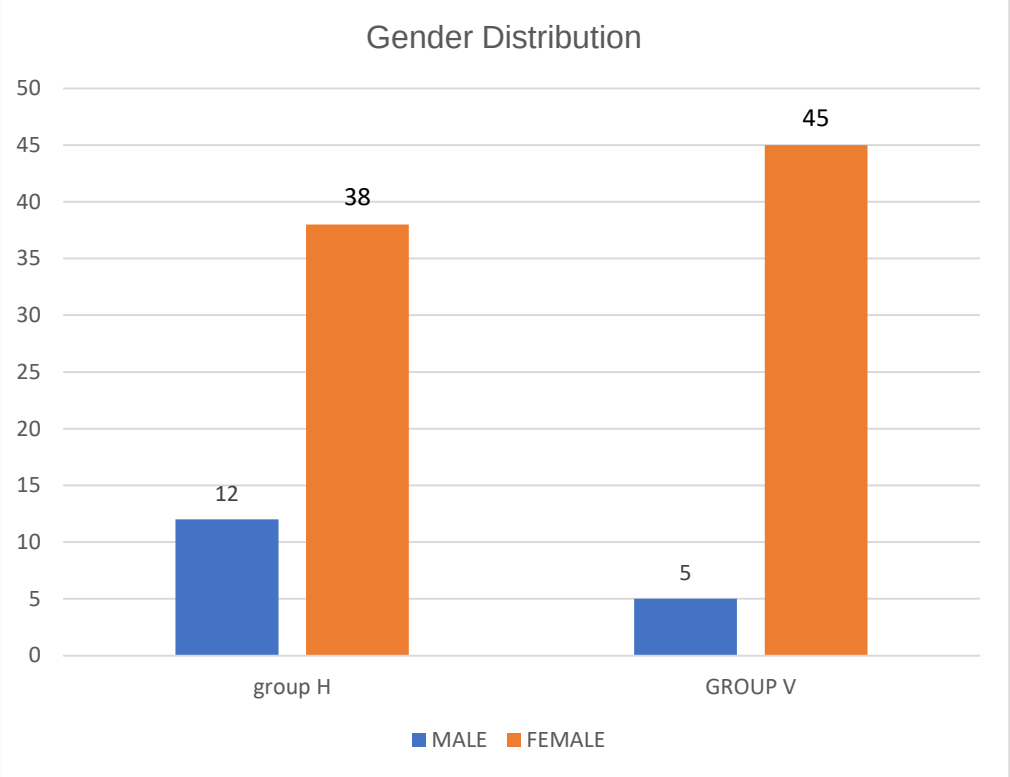


Figure 2: Comparison of study groups according togender distribution.

Table 3: Comparison of Study Groups According to Body Mass Index (BMI) kg/m^2.

GROUP	RANGE	MEAN	STANDARD DEVIATION	P value
H	33.23-22.4	26.12	4.40	0.403
V	29.13-21.3	25.36	4.59	

There was no statistically significant difference (p>0.05) in the mean body mass index distribution among patients in both the groups (p value of 0.403). The mean body mass index of patients who received oxygen via HFNC was 26.12±4.40 and in the venturi mask group was 25.36±4.59.

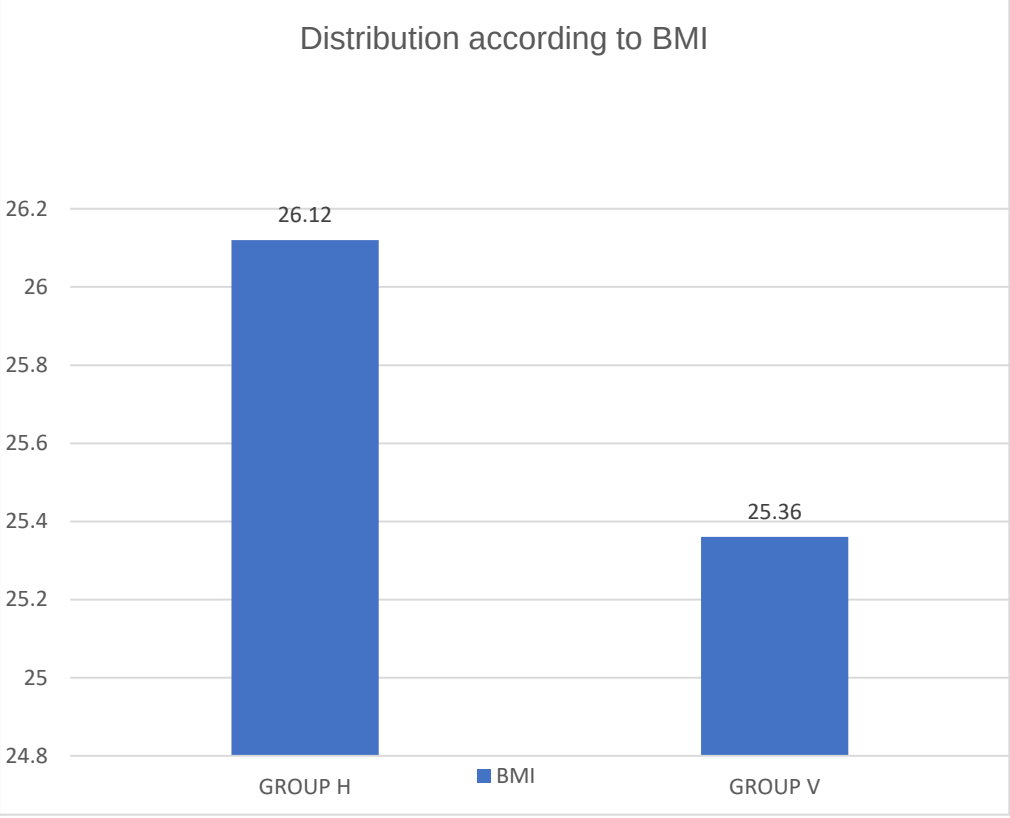


Figure 3: Comparison of Study Groups According to Body Mass Index (BMI) kg/m^2.

Table 4: Comparison of study group according to ASA distribution of subjects.

		Group H		Group V		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
ASA	1	22	44%	30	60%	52	2.564	0.109
	2	28	56%	20	40%	48		

In group H 44% and 56% of patients belong to ASA I and ASA II category respectively.

In group V 60% and 40% belongs to ASA I and ASA II category respectively. Both the groups were comparable and there was no statistically significant difference.(p>0.05)

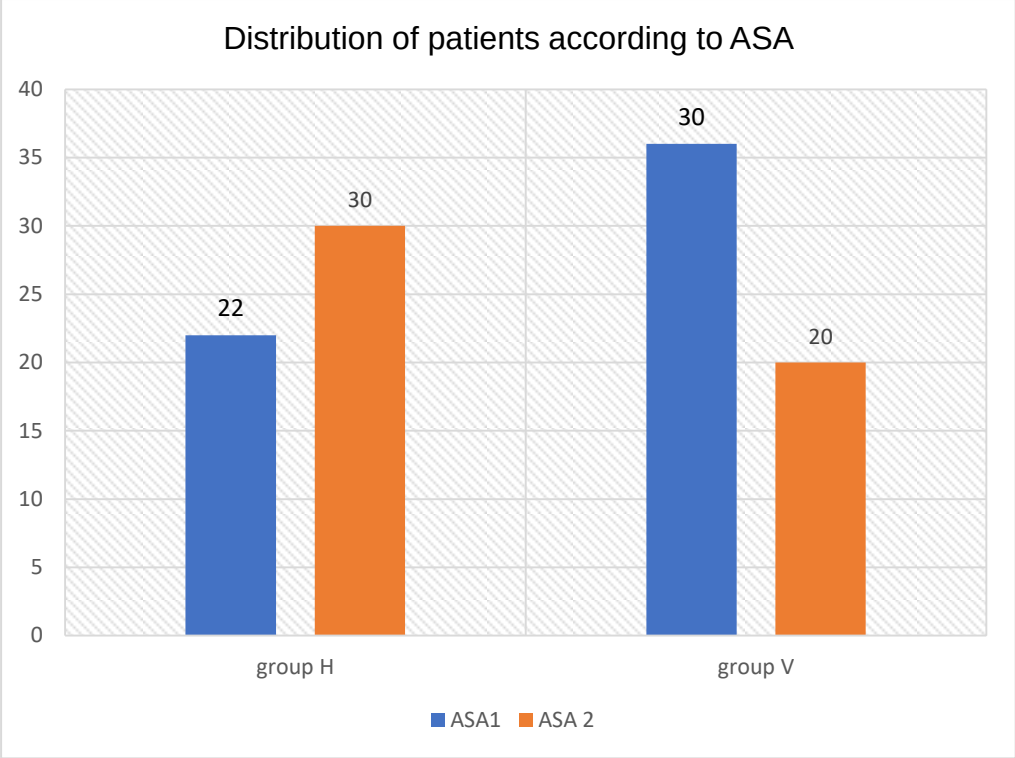


Figure 4: Comparison of study groups according to ASA distribution of subjects.

Table 5: Comparison of amount of propofol and ketamine administered in two groups.

	Group H		**Group V**		t/Z	p-value
	Mean	SD	Mean	SD		
Total amount of ketofol	9.80	2.77	8.92	3.27	1.452	0.150
total amount of propofol	88.20	24.93	80.28	29.42	1.452	0.150
total amount of ketamine	39.20	11.08	35.68	13.08	1.452	0.150

Total amount of intravenous drug administered in both groups remain comparable. Mean values of drug received by Group H – ketofol9.80±2.77ml Propofol 88.20±24.93mg and Ketamine 39.20±11.08 mg. Mean values of drug in Group V- ketofol is 8.92±3.27ml, Propofol is 80.28±29.42mg, and Ketamine is 39.20±11.08 microgram.Difference between two group in not statistically significant as p>0.05.

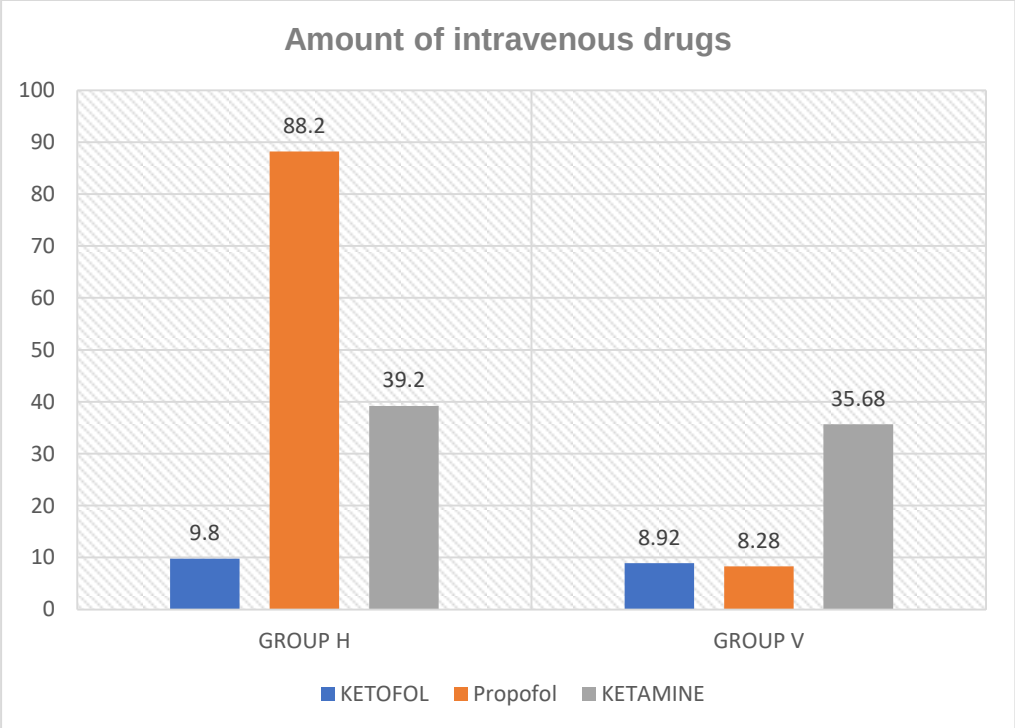


Figure 5: Comparison of amount of propofol and ketamine administered in two groups.

Table 6A: Comparison of incidence of complications (SpO_2<90%) in study groups.

		Group H		Group V		Total	Chi-square value	p-value
		No. of cases	%	No. of cases	%			
Complication SpO_2<90%	No	38	76%	20	40%	58	13.3	0.000
	Yes	12	24%	30	60%	42		
Total		50	100%	50	100%	100		

Table 6B: Comparison of need of airway manoeuvre in groups.

		Group H		Group V		Total	Chi-square value	p-value
		No. of cases	%	No. of cases	%			
Need for airway manoeuvre	No	38	76%	20	40%	58	13.3	0.0001
	Yes	12	24%	30	60%	42		

Table 6C:Comparison of need of airway adjunct in groups.

		Group H		Group V		Total	Chi-square value	p-value
		No. of cases	%	No. of cases	%			
need for airway adjunct	NO	50	100%	48	96%	98	2.041	0.360
	bag n mask ventilation	0	0%	1	2%	1		
	oral airway	0	0%	1	2%	1		

Table 6D: Comparison of need of intubation in study groups.

		Group H		Group V		Total	Chi-square value	p-value
		No. of cases	%	No. of cases	%			
need for intubation	No	50	100%	50	100%	100	-	-

Out of 50 subjects who received oxygen via HFNC only 12 of them was desaturated when oxygen saturation decreased below 90%(table 6A,fig 6). All of them were managed by head tilt and jaw thrust none of them required any air way device orintubation. On the other hand, subjects of group V who received oxygen via venturi mask, 30 out of 50 desaturated to 90%, 28 of them were managed by airway manoeuvre but 1 needed oral airway and 1 subject needed bag and mask ventilation none required intubation. (Table6B, table 6C, table 6D, Fig 6)

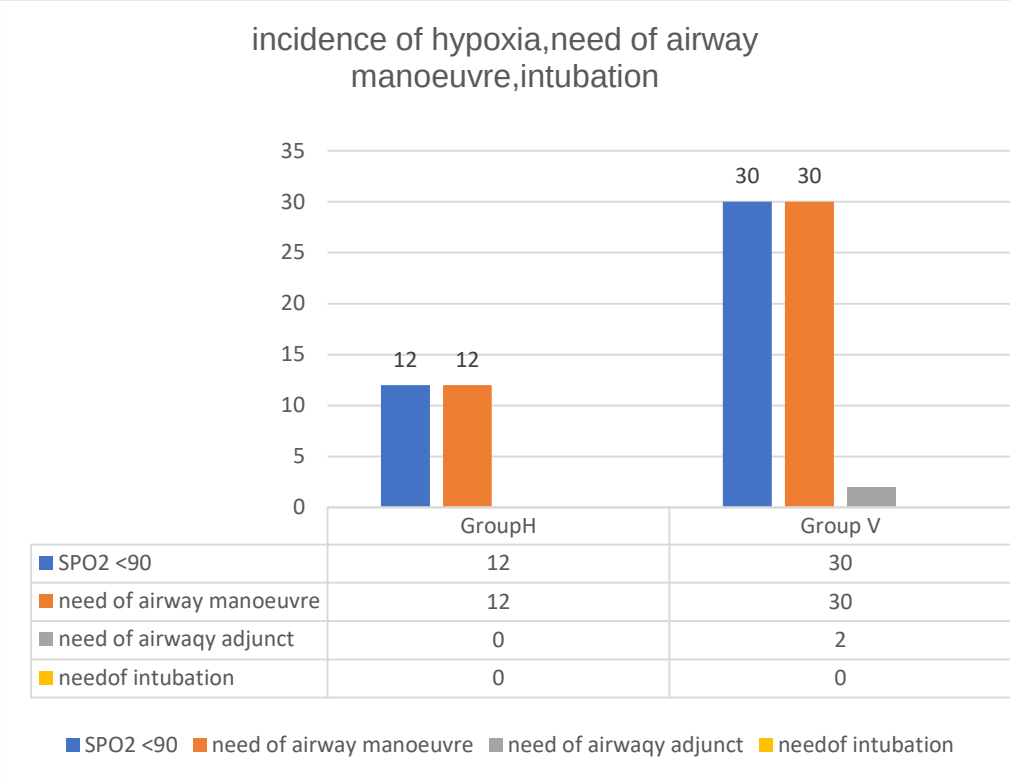


Figure 6: Figure showing incidence of hypoxia, need of airway manoeuvre and need of intubation in study groups.

Intra-group comparison in GROUP V

Table 7: Patients in group V, who desaturated, in relation with BMI.

Group V						
Saturation fall to SpO_2<90%	No		Yes		Z	p-value
	Median	IQR	Median	IQR		
BMI	24.2	22.48-26.48	26.6	25-29.13	-2.398	0.016

Median BMI of patients who desaturated to SpO_2 <90% was 26.6kg/m^2 and who maintained their saturation all throughout procedure was 24.2kg/m^2.This observation was statistically significant as p<0.05.

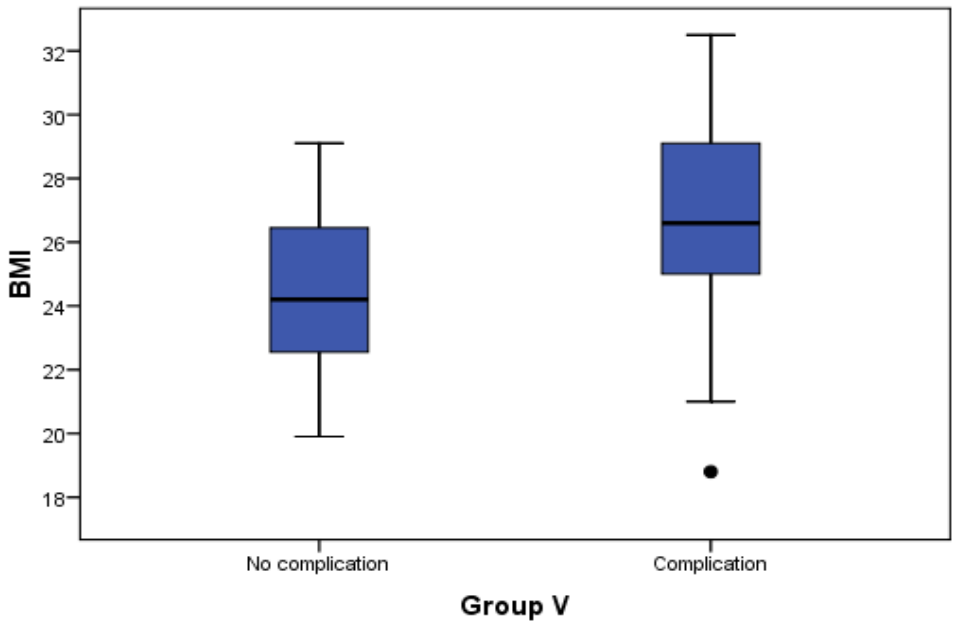


Figure 7: Patients in group V, who desaturated, in relation with BMI.

INTRAGROUP COMPARISON IN GROUP H

Table 8: Patients in group H, who desaturated, in relation with BMI.

Group H						
SpO_2fall <90%	No		Yes		Z	p-value
	Median	IQR	Median	IQR		
BMI	24.95	23.25-227.20	29.65	24.33-33.23	-2.364	0.018

Median BMI of patients who desaturated to SpO_2 <90% was 9.65 kg/m^2 and who maintained their saturation all throughout procedure was 4.95 kg/m^2. This observation was statistically significant as $p<0.05$.

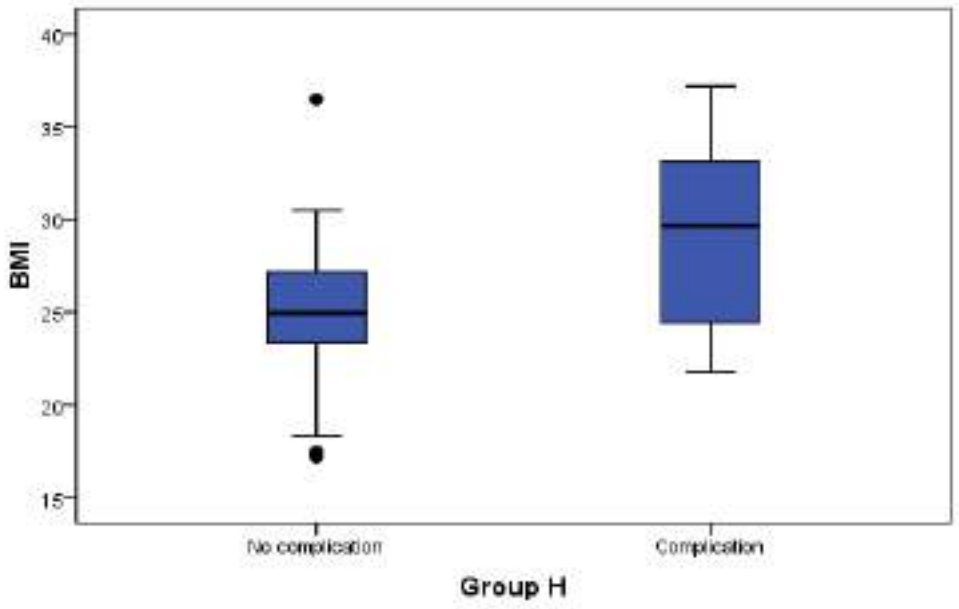


Figure 8: Patients in group H, who desaturated, in relation with BMI.

Table 9: Comparison of patients (with BMI < 25kg/m^2) who desaturated in both groups.

BMI<25 kg/m^2		Group H		**Group V**		Total	Chi-square value	p-value
Saturation <90%	No	19	83%	11	65%	30	1.671	0.574
	Yes	4	17%	6	35%	10		
	Total	23	100%	17	100%	40		

In our study we observed that in patients with BMI < 25 kg/m^2, 17% in group H and 35% in group V had desaturated (spo2<90%) whereas 83 % in group H and 65% in group V were able to maintain saturation throughout the procedure. These, results however, were not statistically significant (p value>0.05)

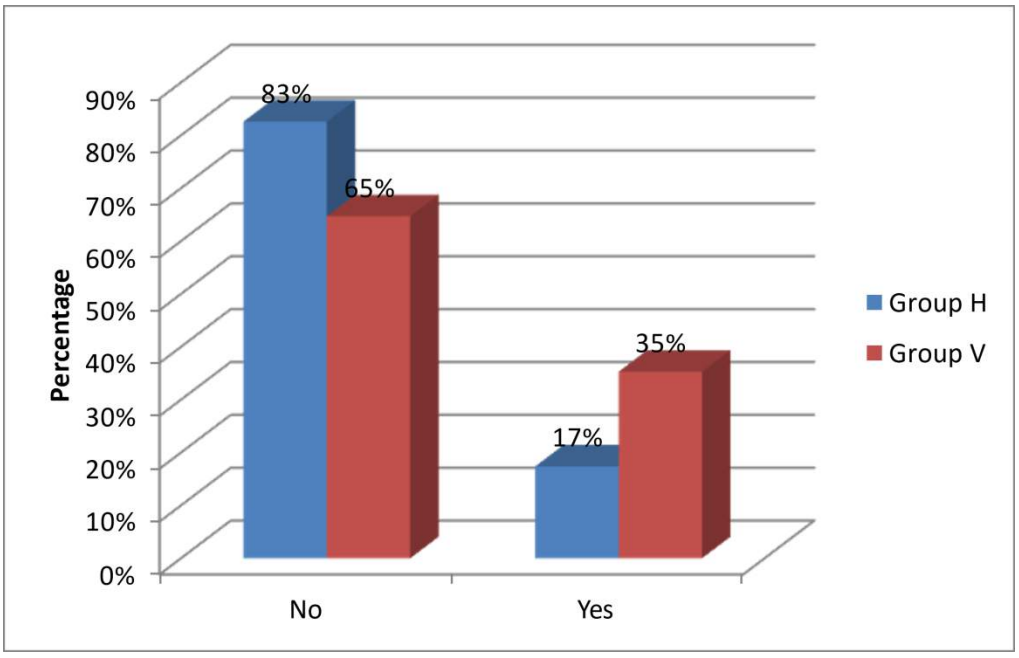


Figure 9: Comparison of patients (with BMI < 25kg/m^2) who desaturated in both groups.

Table 10: Comparison of patients (with BMI > 25kg/m^2) who desaturated in both groups.

BMI GROUP >25		Group H		Group V		Total	Chi-square value	p-value
		Group H	Group H	Group V	Group V			
saturation <90%	NO	19	70%	9	27%	28	11.082	0.001
	YES	8	30%	24	73%	32		
Total		27	100%	33	100%	60		

In our study we observed that in patients with BMI >25 kg/m^2, 30% in group H and 73% in group V had desaturated (SpO_2<90%) whereas 70% in group H and 27% in group V were able to maintain saturation throughout the procedure. These results were found to be statistically significant (p value<.05)

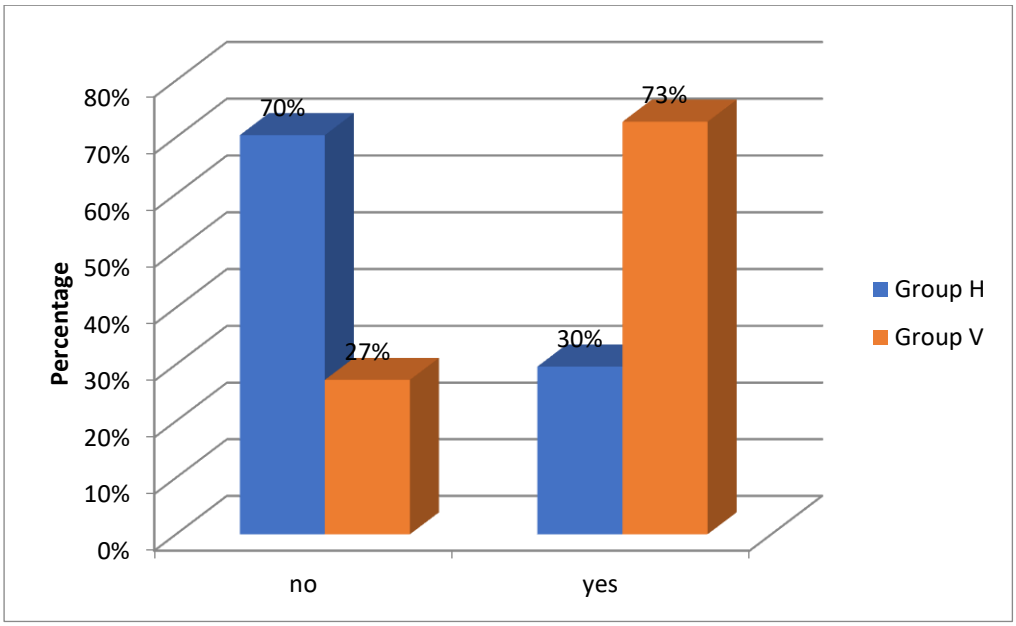


Figure 10: Comparison of patients (with BMI > 25kg/m^2) who desaturated in both groups.

Table 11: Comparison of Intraoperative heart rate in two groups.

	Group H		Group V		t/Z	p-value
	Mean	SD	Mean	SD		
HR0	88.26	12.55	87.58	14.83	0.248	0.805
HR5	92.38	10.63	97.08	15.22	-1.790	0.077
HR10	93.12	10.05	97.12	14.44	-1.608	0.111
HR15	91.38	11.39	95.30	11.78	-1.692	0.094
HR20	89.14	10.85	91.52	13.79	-0.959	0.340

Patients in both the groups remained hemodynamically stable through the intraoperative and postoperative period.

The comparative intraoperative heart rate trends at 5 minute intervals are as follow. The mean baseline heart rate was 88.26±12.55 and 87.58±14.83 beats per minute in group H and group V respectively. There was no statistical difference between mean heart rate in both groups. Thereafter mean heart rate at 5,10,15,20 minutes ranges from 89-92 beats per minute in group H, 95-91 beats per minute in group V and were statistically similar as p>0.05.

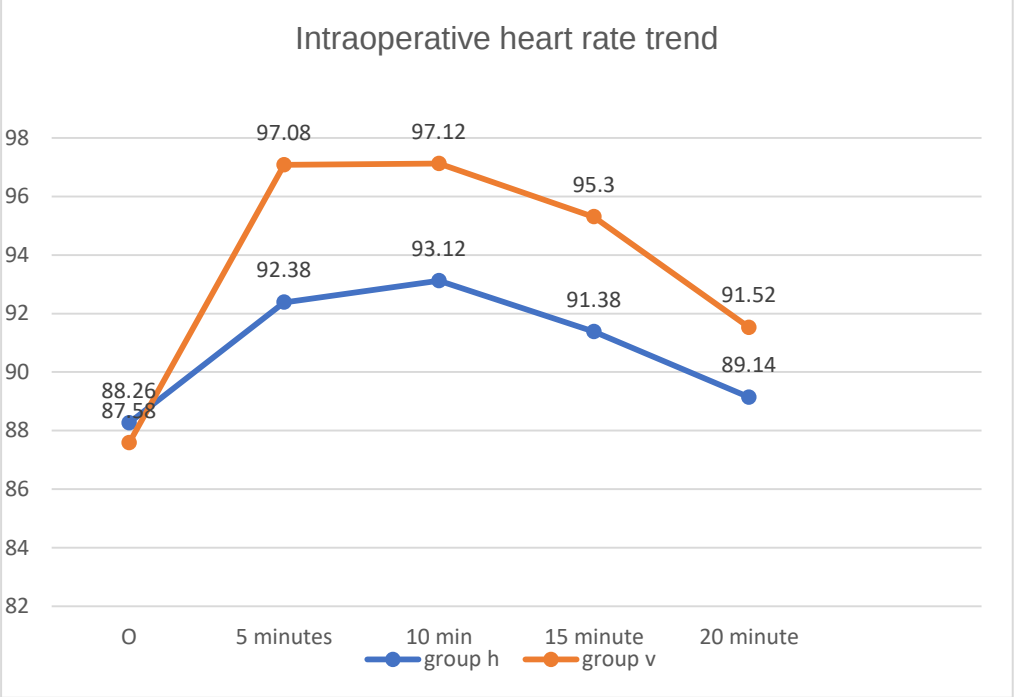


Figure 11: Comparison of Intraoperative heart rate in two groups.

Table 12: Comparison of trend in intraoperative systolic blood pressure in two groups.

	Group H		Group V		t/Z	p-value
	Mean	SD	Mean	SD		
SBP0	128.00	14.00	124.38	13.06	1.337	0.184
SBP5	129.54	13.99	123.92	21.01	1.574	0.119
SBP10	128.12	21.94	125.38	13.05	0.759	0.450
SBP15	127.48	15.03	124.04	11.78	1.274	0.206
SBP20	127.70	13.67	125.80	10.96	0.767	0.445

The comparative intraoperativesystolic blood pressure trends at 5 minutes intervals are as follow. The mean baseline systolic blood pressure was 128.00±14.00 and 124.38±13.06 mm Hg in group H and group V respectively. There was no statistical difference between mean systolic blood pressure in both groups. Thereafter mean systolic blood pressure at 5,10,15,20 minutes ranges from127.48 to129.54 mmHg in group H, and 123.92 to 125.80 mmHg in group V and were statistically similar as p>0.05.

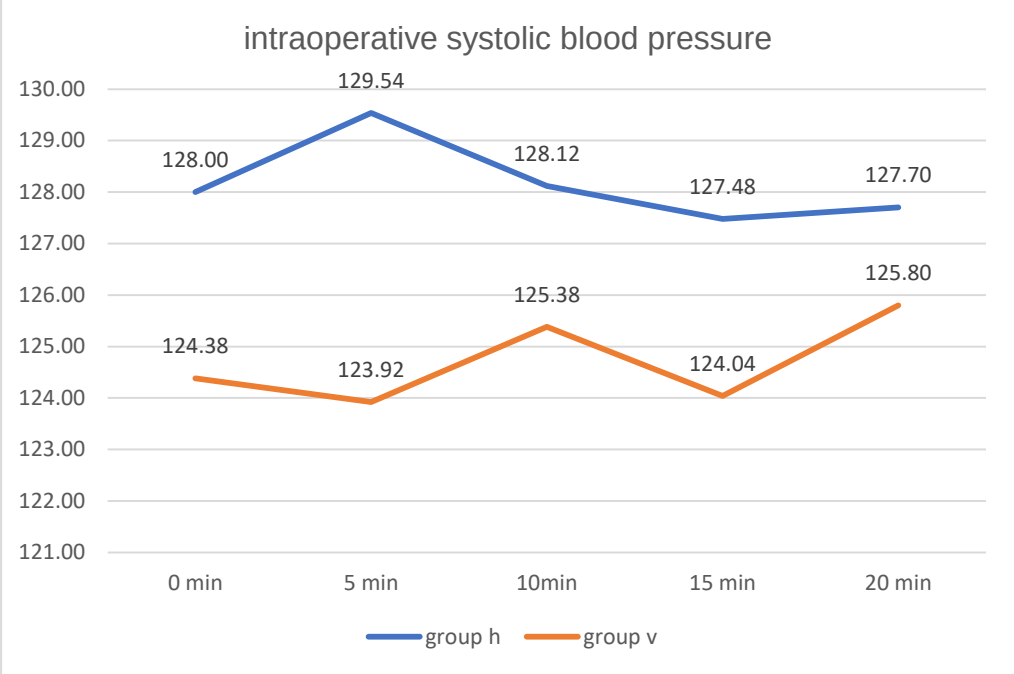


Figure 12: Comparison of trend in Intraoperative systolic blood pressure in two groups.

Table 13: Comparison of Intraoperative diastolic blood pressure in two groups.

	Group H		**Group V**		t/Z	p-value
	Mean	SD	Mean	SD		
DBP0	80.10	10.40	77.10	11.91	1.341	0.183
DBP5	81.72	13.45	78.66	12.86	1.163	0.248
DBP10	81.08	12.58	77.06	12.49	1.603	0.112
DBP15	80.44	11.95	78.14	9.87	1.050	0.297
DBP20	80.18	10.74	80.98	8.34	-0.416	0.678

The comparative intraoperativediastolic blood pressure trends at 5 minute intervals are as follow. The mean baseline diastolic blood pressure was 80.10±10.40mmHg and 77.10± 11.91 mm Hg in group H and group V respectively. There was no statistical difference between mean diastolic blood pressure in both groups. Thereafter diastolic blood pressure at 5,10,15,20 minutes ranges from80.10 to 81.72 mm Hg in group H, and 77.10 to 80.98 mm Hg to in group V and were statistically similar as p>0.05.

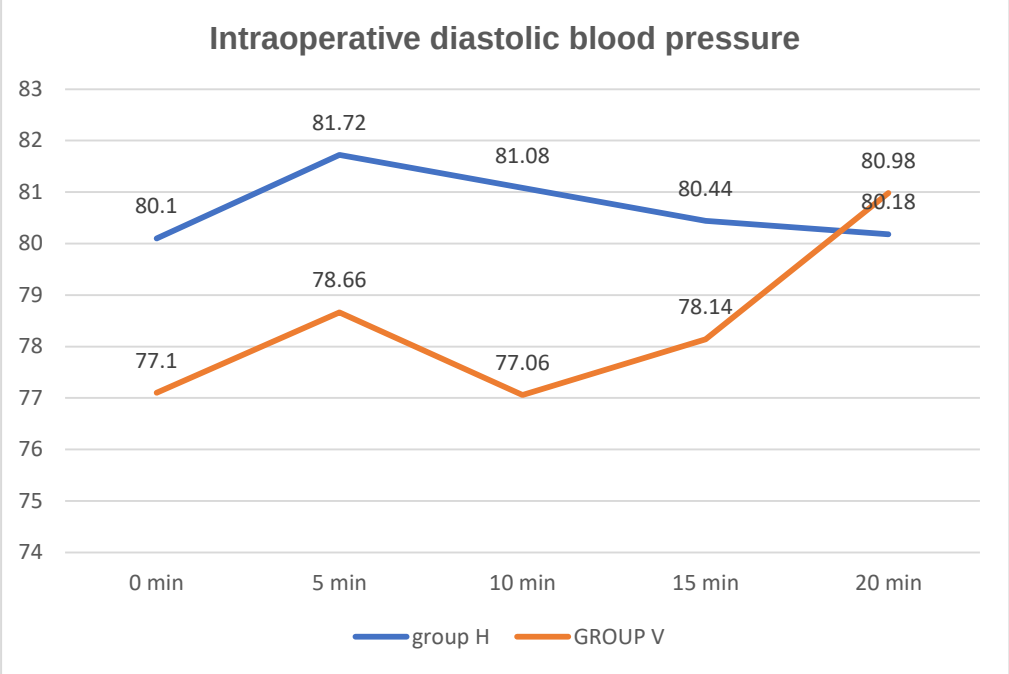


Figure 13: Comparison of Intraoperative diastolic blood pressure in two groups.

Table 14: Comparison of Intraoperative mean arterial pressure in two groups.

	Group H		Group V		t/Z	p-value
	Mean	SD	Mean	SD		
MAP0	96.07	10.83	92.86	11.75	1.419	0.159
MAP5	97.66	12.75	93.75	14.30	1.444	0.152
MAP10	96.76	14.49	93.17	11.87	1.357	0.178
MAP15	96.12	12.33	93.44	9.64	1.211	0.229
MAP20	96.02	11.17	95.92	8.42	0.051	0.960

The comparative intraoperativemean blood pressure trends at 5 minutes intervals are as follow. The mean baseline mean blood pressure was 96.07±10.83 mmHg and 92.86± 11.75 mm Hg in group H and group V respectively. There was no statistical difference between mean blood pressure in both groups. Thereafter mean blood pressure at 5,10,15,20 minutes ranges from96.02 to 97.66 mm Hg in group H, and 93.17 to 95.92 mm Hg to in group V and were statistically similar as p>0.05.

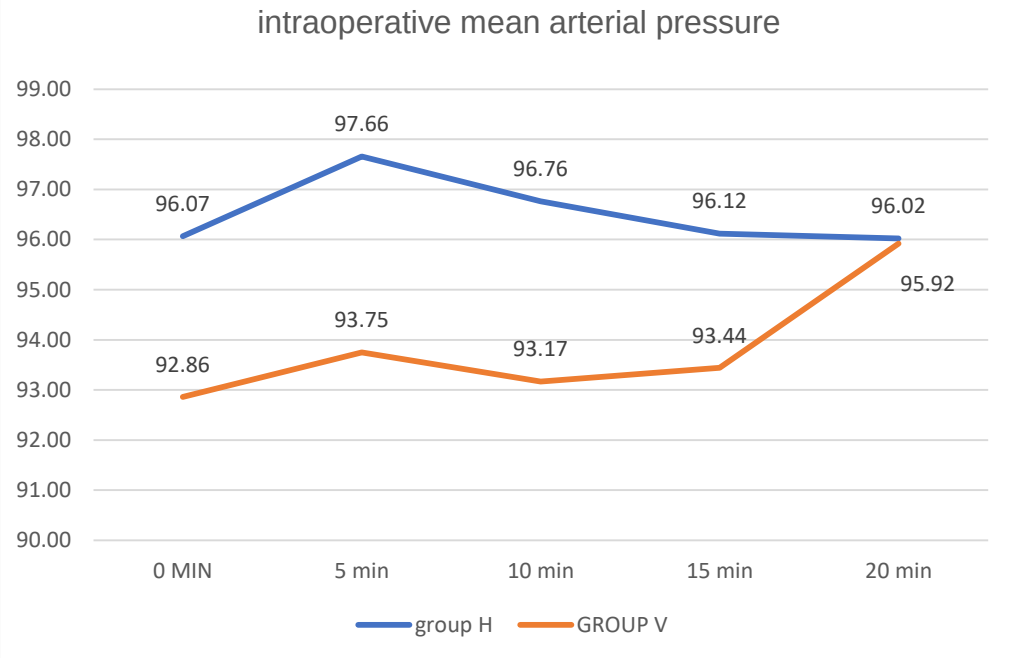


Figure 14: Comparison of Intraoperative mean arterial pressure in two groups.

Table 15: Comparison of Intraoperative Oxygen Saturation in two groups.

	Group H		**Group V**		t/Z	p-value
	Mean	SD	Mean	SD		
SAT0	98.92	1.21	98.80	1.14	0.510	0.611
SAT5	97.78	2.63	96.56	3.23	2.070	0.041
SAT10	97.04	3.69	93.98	3.88	4.044	0.000
SAT15	98.38	1.89	96.32	2.61	4.521	0.000
SAT20	99.00	1.05	98.20	1.26	3.447	0.001

Intraoperative SpO_2 trend is as follows. Baseline mean saturation in Group H was 98.92 ± 1.21% and in GROUP V was 98.80 ± 1.14%, which was comparable. At 5,10.15,20minute interval mean SpO_2 in GROUP H was 97.78 ± 2.63%, 97.04 ± 3.69%,98.38 ± 1.89%,99.00 ± 1.05% respectively. In GROUP Vat 5,10,15,20minute interval SpO_2 was 96.65 ± 3.23%,93.98 ± 3.88%,96.32 ± 2.61%, 98.20 ± 1.26% respectively. Difference in mean saturation in both groups is statistically significant as p<0.05

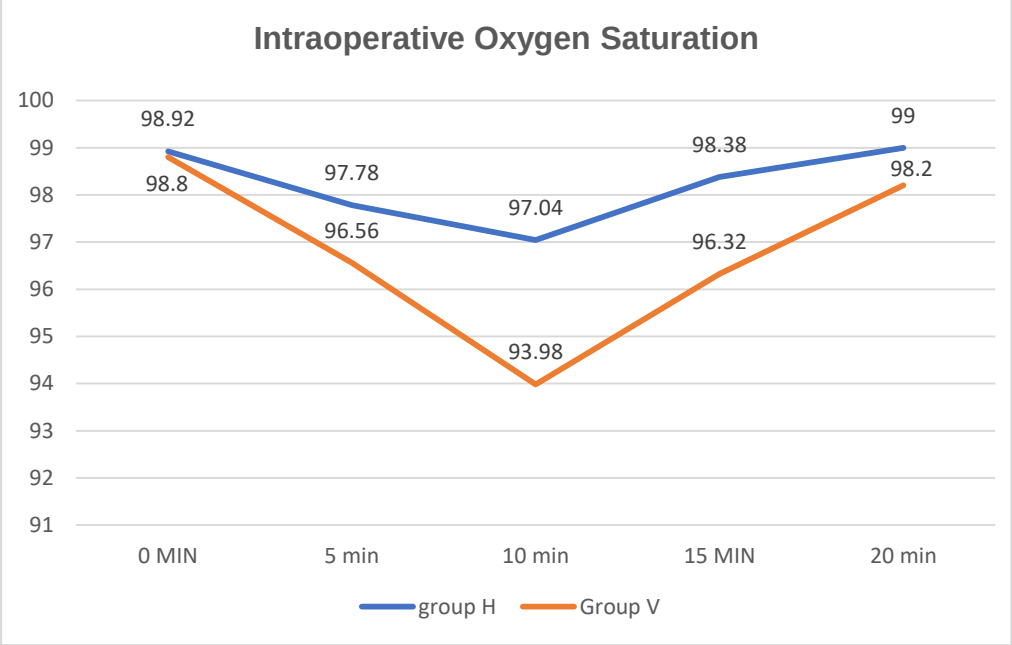


Figure 15: Comparison of Intraoperative Oxygen Saturation in two groups.

POST OPERATIVE PARAMETERS

Table 16: Comparison of Postoperative heart rate in two groups.

	Group H		**Group V**		t/Z	p-value
	Mean	SD	Mean	SD		
PHR0	85.96	10.22	89.74	10.83	-1.794	0.076
PHR10	86.08	10.55	87.14	9.92	-0.518	0.606
PHR20	83.94	9.68	84.24	10.22	-0.151	0.881
PHR30	83.72	9.85	82.46	9.75	0.643	0.522
PHR40	82.06	10.11	81.22	9.83	0.421	0.675
PHR50	81.44	9.07	79.96	9.03	0.818	0.416
PHR1	79.62	8.90	78.78	9.26	0.463	0.645
PHR1:10	85.00	10.83	83.02	11.56	0.884	0.379
PHR1:20	84.18	11.94	83.66	12.61	0.212	0.833
PHR1:30	82.48	11.06	80.58	11.85	0.829	0.409
PHR1:40	80.76	11.02	79.74	10.65	0.471	0.639
PHR1:50	79.30	10.80	78.36	10.64	0.438	0.662
PHR2	77.94	10.57	76.78	10.07	0.562	0.576

On inter-group comparison between group H and V, difference in mean heart rate was statistically non-significant at all time interval postoperatively (p value>0.05) .

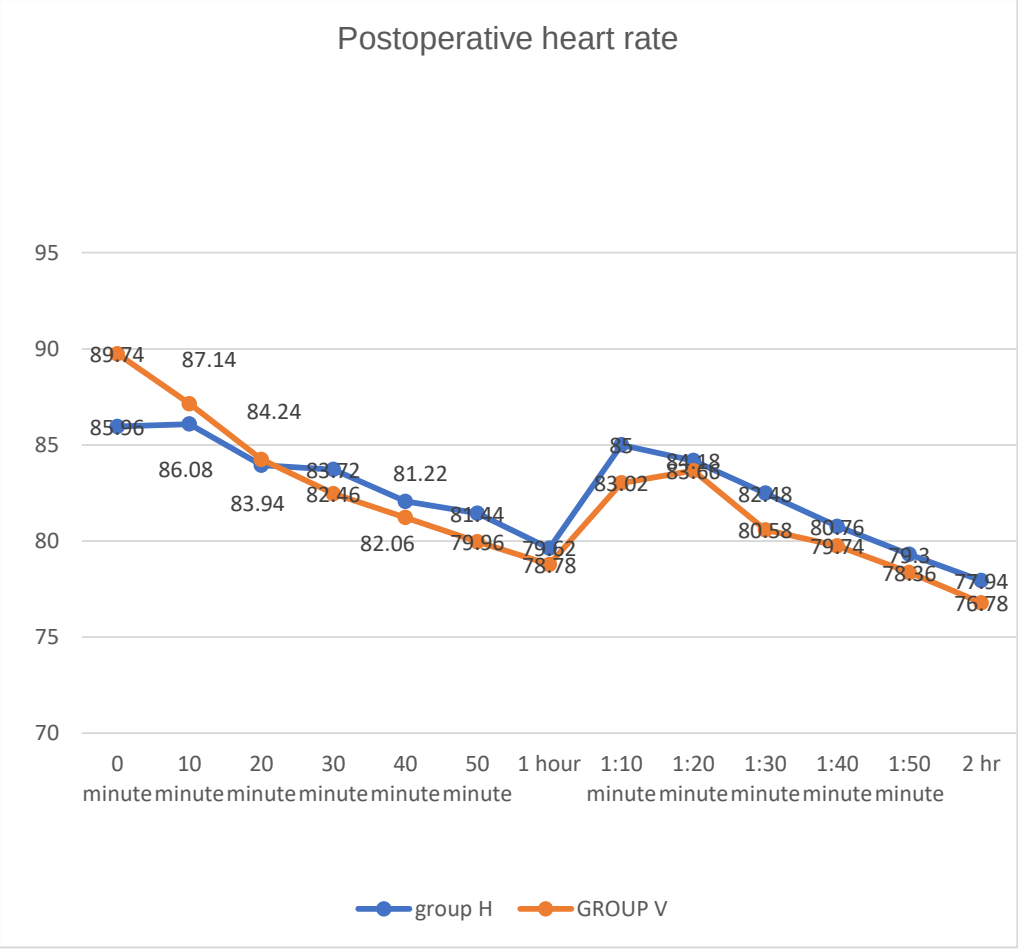


Figure 16: Comparison of Postoperative heart rate in two groups.

Table 17: Comparison of Postoperative systolic blood pressure in two groups.

	Group H		Group V		t/Z	p-value
	Mean	SD	Mean	SD		
PSB0	122.26	6.71	122.00	7.04	0.189	0.850
PSB10	123.20	6.54	122.14	6.52	0.812	0.419
PSB20	123.56	8.18	122.16	7.50	0.892	0.374
PSB30	123.30	7.11	121.96	6.77	0.965	0.337
PSB40	123.44	7.76	122.12	7.08	0.888	0.376
PSB50	122.04	8.12	122.42	7.63	-0.241	0.810
PSB1	123.32	6.60	122.68	6.54	0.487	0.627
PSB1:10	125.98	6.73	124.42	8.76	0.998	0.321
PSB1:20	124.70	6.26	124.62	7.58	0.058	0.954
PSB1:30	123.50	5.83	123.62	7.60	-0.089	0.930
PSB1:40	122.32	5.45	122.50	7.27	-0.140	0.889
PSB1:50	121.90	5.61	121.68	6.70	0.178	0.859
PSB2	121.00	6.07	120.52	6.10	0.395	0.694

In the immediate postoperative period and at all time intervals, difference in mean systolic blood pressure was statistically non - significant (p value > 0.05) between two groups.

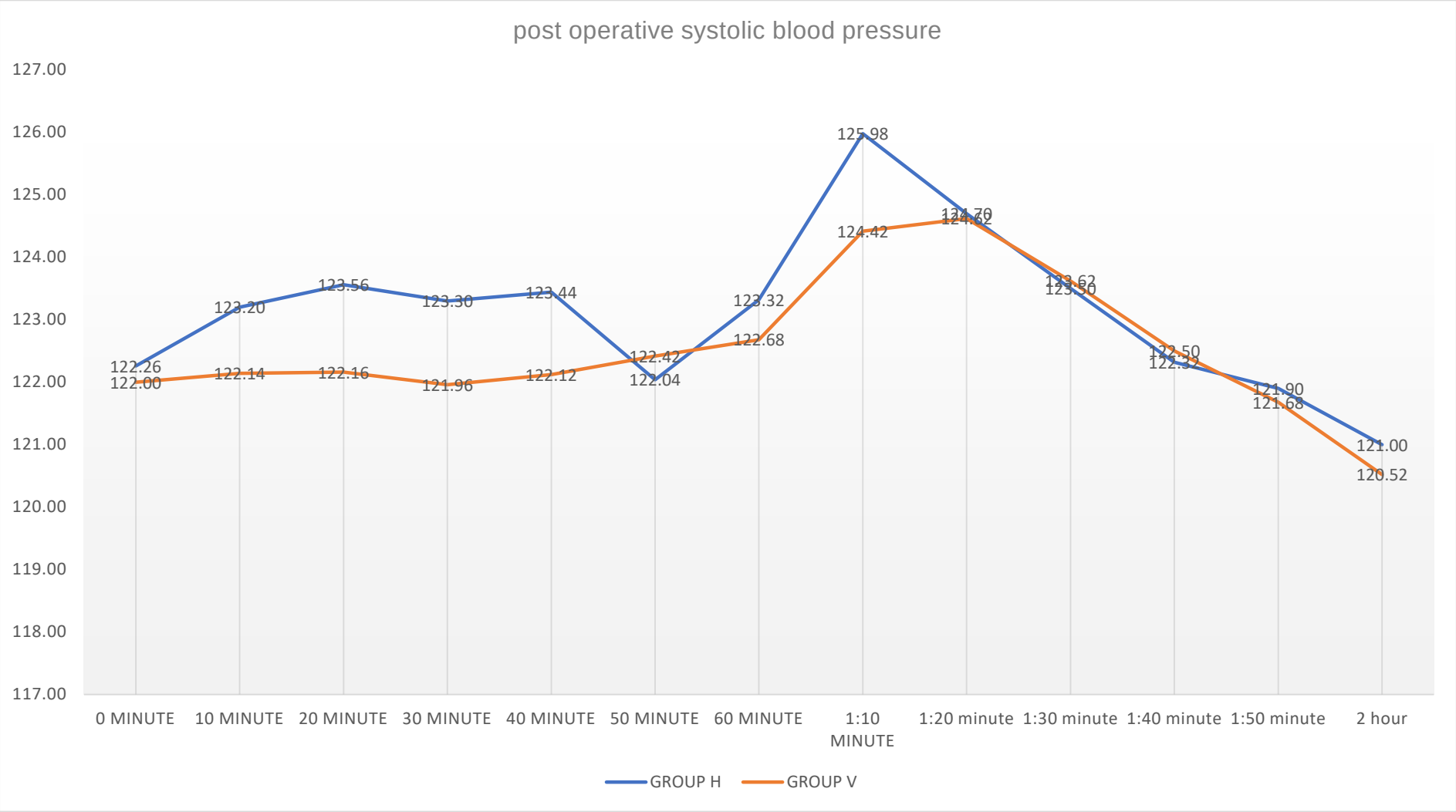


Figure 17: Comparison of Postoperative systolic blood pressure in two groups.

Table 18: Comparison of Postoperative diastolic blood pressure in two groups.

	Group H		Group V		t/Z	p-value
	Mean	SD	Mean	SD		
PDB0	81.24	7.13	79.32	6.61	1.396	0.166
PDB10	80.52	6.36	78.02	8.09	1.718	0.089
PDB20	80.88	6.63	78.90	7.41	1.408	0.162
PDB30	79.28	7.22	78.62	7.02	0.463	0.644
PDB40	79.82	6.61	78.04	6.25	1.384	0.170
PDB50	79.10	6.24	77.90	6.23	0.962	0.339
PDB1	78.68	6.04	77.50	6.40	0.948	0.345
PDB1:10	79.06	8.75	79.78	8.69	-0.413	0.681
PDB1:20	78.18	8.18	78.58	8.14	-0.245	0.807
PDB1:30	76.84	8.14	77.10	8.29	-0.158	0.875
PDB1:40	75.60	7.85	75.96	8.15	-0.225	0.822
PDB1:50	75.02	7.19	75.08	7.37	-0.041	0.967
PDB2	74.32	6.45	74.30	7.48	0.014	0.989

In the immediate postoperative period and at all time intervals, difference in mean diastolic blood pressure was statistically non - significant (p value > 0.05) between two groups.

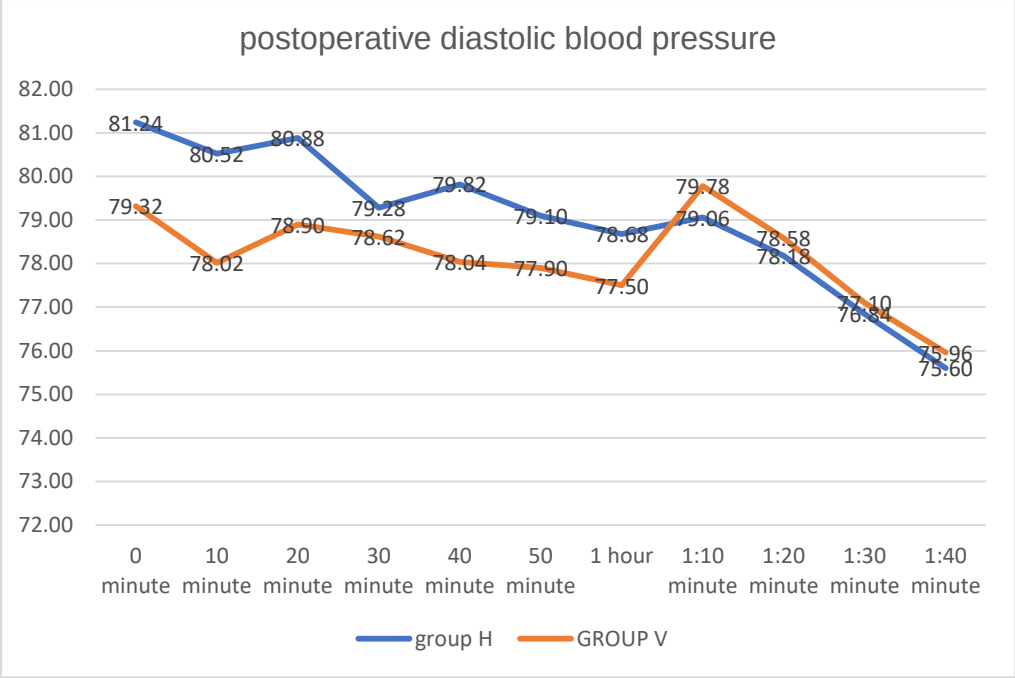


Figure 18: Comparison of Postoperative diastolic blood pressure in two groups.

Table 19: Comparison of Postoperative mean arterial blood pressure (MAP) in two groups.

	Group H		Group V		t/Z	p-value
	Mean	SD	Mean	SD		
PMAP0	94.54	5.89	91.96	13.37	1.248	0.215
PMAP10	94.30	5.31	92.44	6.41	1.580	0.117
PMAP20	94.76	5.85	92.82	6.18	1.611	0.110
PMAP30	93.58	6.15	91.54	5.87	1.696	0.093
PMAP40	94.27	5.53	92.10	5.56	1.954	0.054
PMAP50	93.37	5.75	91.49	5.40	1.685	0.095
PMAP1	93.30	5.41	91.88	5.19	1.340	0.183
PMAP1:10	94.56	6.65	94.50	7.11	0.044	0.965
PMAP1:20	93.52	6.19	91.76	14.69	0.781	0.437
PMAP1:30	92.38	5.93	92.48	6.43	-0.081	0.936
PMAP1:40	90.94	6.12	91.40	6.06	-0.378	0.706
PMAP1:50	90.56	5.28	90.46	5.82	0.090	0.928
PMAP2	89.74	5.45	89.52	5.99	0.192	0.848

In the immediate postoperative period and at all time intervals, difference in mean arterial pressure was statistically non -significant (p value > 0.05) between two groups.

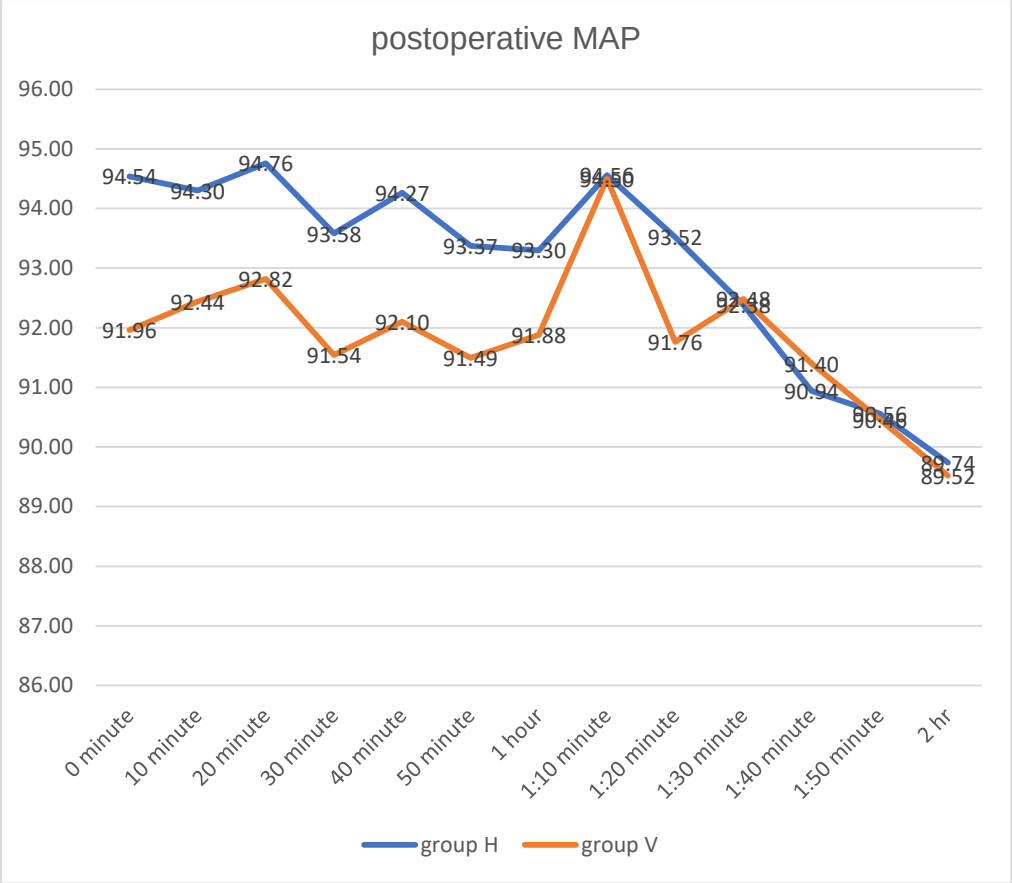


Figure 19: Comparison of Postoperative mean arterial blood pressure (MAP) in two groups.

Table 20: Comparison of Postoperative oxygen saturation in two groups.

	Group H		**Group V**		t/Z	p-value
	Mean	SD	Mean	SD		
PSAT0	98.66	1.14	98.72	0.81	-0.304	0.762
PSAT10	98.90	1.02	98.88	0.96	0.101	0.920
PSAT20	99.06	0.87	98.96	0.92	0.558	0.578
PSAT30	99.04	0.88	99.08	0.83	-0.234	0.815
PSAT40	99.04	0.83	99.02	1.00	0.109	0.914
PSAT50	99.08	0.85	99.10	0.89	-0.115	0.909
PSAT1	99.18	0.69	99.08	0.97	0.596	0.553
PSAT1:10	99.02	0.14	99.02	0.14	0.000	1.000
PSAT1:20	98.36	0.53	98.42	0.57	-0.545	0.587
PSAT1:30	99.22	0.51	99.34	0.63	-1.053	0.295
PSAT1:40	99.08	0.67	99.32	0.62	-1.865	0.065
PSAT1:50	99.08	0.67	99.32	0.62	-1.865	0.065
PSAT2	99.06	0.68	99.30	0.65	-1.805	0.074

In the immediate postoperative period and at all time intervals, difference in oxygen saturation was statistically non -significant (p value > 0.05) between two groups.

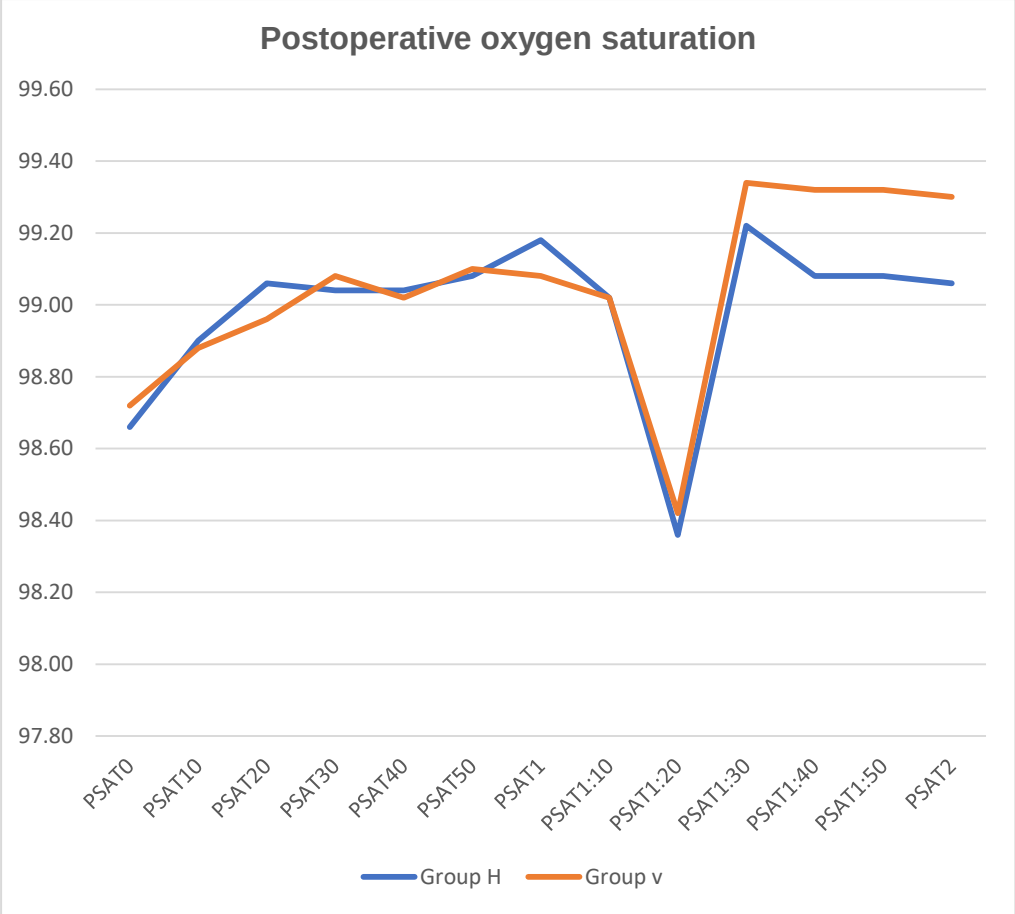


Figure 20: Comparison of Postoperative oxygen saturation in two groups.

DISCUSSION

Management of airway in the operating room and non-operating room settings always hold prime importance for anesthesiologists. Since the advent of oxygen therapy, in anaesthesia a genre of devices has been tested and used in operating room settings on patients. Variety of oxygen delivery devices are available ranging from low flow oxygen delivery systems including -nasal cannula, simple mask, partial rebreather mask, non-rebreather mask to high flow delivery systems including air entrainment mask (venturi mask), air entrainment nebulizer, nasal high flow oxygen therapy, mechanical ventilators (oxygen delivery device). Anaesthesiologists use these devices as per the need of the patient's oxygen requirement and invasiveness of surgical procedure. Conscious sedation or spontaneous respiration under intravenous anaesthesia (STRIVE) is relatively newer option which is being employed in ambulatory anaesthesia and day care surgeries. While patient is under sedation close monitoring of airway, respiration, oxygenation must be done and spontaneous ventilation should be maintained all through the procedure.[10] In routine practice standard of care for these patients is conventional oxygen therapy which includes nasal cannula, simple facemask and venturi mask and but still a significant percentage patients desaturate in OR settings.[16]

The present study aims to compare the oxygenation using venturi mask and high flow nasal cannula (HFNC) in patients undergoing minor surgery under total intravenous anaesthesia (TIVA).Both, of these devices(venturi mask and HFNC) belong to high flow oxygen delivery systems. Venturi mask utilizes Venturi effect which is based on the Bernoulli's principle. As compared to low flow systems (nasal cannula, simple face mask), venturi mask can deliver high flows, but can achieve maximum FiO2 of 0.5 only.[25] In contrast, HFNC is capable of delivering higher FiO2 ranging from 0.2 to 1.0and flow rates can vary from 20l/min to 60l/min at 37 degree Celsius.[43]

Oxygen delivered by venturi mask remains cold and dry, which leads to dryness of airway mucosa [25] and decreases muco-ciliary clearance.

Even short periods of exposure to cold and dry respiratory gases have adverse effects on respiratory mechanics, increases work of breathing, and may even release pro-inflammatory cytokines.[48, 62] HFNC has in built air blender, humidification and heating system so it is capable of delivering high flows of heated and humidified oxygen.

HFNC is already receiving growing attention as an alternative respiratory support in critical care settings and is used in patients with different underlying diseases.[61] There are several studies in literature confirming HFNC a better and comfortable oxygenation device with lesser adverse effects.[53,57,58,59] Though, current studies are very encouraging and promise a clinical benefit on patient's outcomes, randomized trials are still needed to demonstrate that HFNC provides a better way of oxygenation.HFNC has been compared with various oxygen delivery devices like nasal cannula, simple face mask, non-invasive ventilation,[53,57,58,59] in critical care settings, but to the best of our knowledge very few studies[16] comparing HFNC and venturi mask in operating room settings are available till date., So, we decided to compare them both in OR (operating room) environment.

Lin Y et al compared nasal cannula at flow rates of 2l/min and HFNC at flow rate of 30-60l/minon patients undergoing gastroscopy under propofol sedation. In their study, they found HFNC as better oxygenating device.[52]

Douglas et al. compared HFNC at flow rate of 30l/min during pre-oxygenation and was increased to 50l/min after patients were under sedation and face mask group at flow rate of 10l/min. They did not find statistically significant difference in oxygenating capacity of HFNC and face mask.[57]

In our study we used HFNC (group H) at flow rate of 50L/min and FiO_2 at 0.5, and venturi mask(group V)at flow rate of 6l/min FiO_2 0.5 while patient is under total intravenous anaesthesia(TIVA)breathing spontaneously which is similar to study by Booth et al.[2] and Roman et al.[51]

Booth et al. applied HFNC on patients undergoing micro-laryngeal airway surgery under conscious sedation. They used HFNC at flow rate

of 50l/min and found this was well tolerated by all patients.[2]Roman et. al. in their study used flow rate of 3-6L/minute via nasal cannula, 60L/min via HFNC and found there was improved oxygenation and decrease utilization of general anaesthesia with HFNC in patients undergoing ERCP under sedation.[51]

From our study, use of high flow nasal cannula (group H)reduces the percentage of patients desaturating below 90% as compared to venturi mask (group V).

76% and 40%of patients in group H and group V respectively were able to maintain oxygen saturation above 90%all throughout the procedure, and this difference was statically significant.

Similar results were also reported by Lin Y et al in 2019. They conducted study on 1994 outpatients undergoing routine gastroscopy with propofol sedation and concluded that HFNC oxygen therapy decreased the incidence of hypoxia (SpO_2 between 75% to 90%) from 8.4% to 0% and incidence of severe hypoxia (SPO_2<75%) from 0.6% to 0%.[52]

In a study on patients undergoing bronchoscopy under conscious sedation Douglas et al found 87% and 20% of patients in HFNC and standard oxygen group respectively, maintained oxygen saturation above 90%.[57]

In our study, in group H 24% (12 out 50 patients) of patient become apneic/ developed airway obstruction, and desaturated below 90% and they were managed conservatively by airway manoeuver (head tilt jaw thrust) to clear airway obstruction, and none of them required any airway adjunct or tracheal intubation. On the other hand,60%patients (32 out of 50) in group V become apneic/ developed airway obstruction, and desaturated below 90%, among them 28 patients were managed by jaw thrust but 1 required oral airway and 1 required bag and mask ventilation with 100% oxygen, none required invasive airway management.

Booth et al in their study on 26 patients who presented with significant airway compromise used HFNC at flow rates of 50l/min under conscious sedation undergoing micro laryngeal surgery They found no

episodes of apnea or complete airway obstruction during induction phase of anaesthesia.[51] During maintenance phase only 3 patients desaturated below 90% which required airway manoeuver (jaw thrust) only 1 patient required unplanned bag and mask ventilation and tracheal intubation.

Chan lee et al did a case series on 3 obese patients undergoing colonoscopy under propofol sedation. They found minimum oxygen saturation was 88%, 98%,91% in patient 1, patient2,patient 3 respectively. Only patient 1 required airway maneuver (jaw thrust) and none of them required any supraglottic device or tracheal intubation.[61]

In a similar study on pediatric patients undergoing airway surgery under total intravenous anesthesia Jeon Yeon ji et al found out of 45 patients, 40 patients were able to maintain oxygen saturation throughout the procedure and 5 of them desaturated and required tracheal intubation.[3]

Our results are also consistent with other studies which has described the benefits of HFNC for spontaneously breathing patients in a diverse range of scenario such as on post extubation patients in ICU[54], patients with Acute respiratory failure requiring CPAP support[55], and pediatric population with bronchiolitis[56] in ICU.

In our study, though patients from both groups desaturated, only 12 out of 50 patients in HFNC group and 30 out of 50 patients in venturi mask group desaturated below 90%.

Causes of desaturation in present scenario can be:

a) upper airway obstruction because of decreased muscle tone under deep sedation/anaesthesia.

b) hypoventilation/apnea due to deeper depth of sedation

c) any kind of diffusion impairment.

High flows in HFNC tend to improved upper airway patency as it is capable of generating moderate amount of airway pressure which provides splinting effect on upper airway muscles, keeping airway patent. This finding is corroborated by the study of Rachel L Parke et al, they measured air way pressure and end expiratory lung impedance in healthy volunteers and found 2.7±10.7 to 11.9±2.7 cm H2O pressure

is produced when subjects are advised to breath with closed mouth and a cumulative linear increase in end expiratory lung impedance and end expiratory lung volume. They also found positive linear relationship between delivered gas flow and airway pressure measured. For every 10l/min increase in flows there is increase in pressure by 1.16 cm of H_2O and at the highest flow of 100l/min the mean airway pressure measured was 11.9±2.7 cm H_20.[21,38]

HFNC is capable of better oxygenation even if patient shows mild hypoventilation. As observed by Patel and Nourai et al in 2013 that HFNC is capable of “apneic ventilation”. They found that HFNC is capable of ventilation without ventilatory movements which is actually a result of primary supraglottic vortex from above and cardiogenic oscillations from below.[10,18]

HFNC reduce risk of hypoxemia in unintended apnea during sedation. Improved and steady oxygenation allowed time for spontaneous respiration to resume after further sedation was stopped but no such advantage was seen in venturi mask group.[61]

Above stated reasons and studies explain the lesser number of desaturations in HFNC group and justify our results proving HFNC a better oxygenating device than venturi mask.

We also found that median lowest oxygen saturation in HFNC group during intraoperative period was 97.04% as compared to venturi mask group in which median lowest oxygen saturation was 93.98%, this difference was statistically significant. Similar findings were observed by Booth et al in retrospective observational study using spontaneous respiration using intravenous anaesthesia and high flow nasal oxygen(STRIVE Hi).They found that oxygen saturation never dropped down below 97% while preoxygenating with HFNC.[2]

Douglas et al in their study on patients under conscious sedation during bronchoscopy found median lowest SpO_2 during procedure was 97.5% and 92% in HFNC and standard oxygenation group respectively.[58]

In our study, 12 out of 50 patients desaturated in HFNC group and 30 out of 50 patients desaturated in venturi mask group. On further

analysis we observed those patients who desaturated, has BMI on higher side. Patients who desaturated during procedure has median BMI of 29.65 (33.23-24.33) kg/m^2 and 26.6(29.13-25) kg/m^2in group H and Group V respectively. On categorizing and comparing patients according to their BMI, we found out that percentage of patients with BMI<25kg/m^2, who maintained saturation were 83% in group H and 65% in group V, who desaturated were 17% in group H and 35% in group V. In patients with BMI> 25kg/m^2, 70% in group H and 27% in group V maintained saturation all throughout the procedure and30% in group H and 73% in group V were desaturated. In both the scenarios, more percentage of patients maintain their saturation>90% in HFNC group. Patients with higher BMI have higher propensity for loss of upper airway patency, development of basal lung atelectasis, and positive airway pressure generated by HFNC was not sufficient enough to meet this need. This explains reason of few numbers of desaturations in group H. This, finding is similar to study by Clemens et al in-cohort of 2937 procedures under analgo-sedation. In his study he found 1.6% showed significant desaturation and 0.6% showed severe desaturation and subjects with higher BMI desaturated more.[15]

There was no significant difference in cardiovascular parameters i.e., heart rate and blood pressure among two groups intraoperatively even when there was a greater number of desaturations in venturi mask group, this probably because periods of desaturation were so brief to cause any abnormality. This finding is similar to study of N Douglas et al. They carried out a randomized control trial comparing high flow nasal oxygen with standard management for conscious sedation during bronchoscopy. In their study 4 out of 30 patients desaturated (SpO_2<90%) in HFNC group and 10 out of 30 patients desaturated in conventional group. They also found no difference in hemodynamic parameters and no complications like arrhythmias etc. between two group.[57]

We found nostatistically significant difference between two groups in terms of procedural satisfaction score (excellent =5, very good =4, good = 3, fair = 2, poor = 1) and discomfort. Most of patients fall in

“very good” and “good” category. Even though difference was not large enough to make results significant, patients in venturi mask group reported some discomfort in form of dryness of mouth and throat, no such findings were present in HFNC group.[32] Similar results were observed by Gerald Chanques et al in a randomised control trial, they found that the use of heated-humidifier in patients with high flow oxygen therapy is associated with decrease of dryness of mouth and throat causing lesser discomfort.

Chin lee et al in their case series on 3 obese patients reported no dryness of nose, mouth, throat and stomach bloating and overall experience of patients was in excellent and very good category.[61] Lin Y et al in their study reported rhinalgia when they used HFNC at flow rate of 60l/min on patients undergoing routine gastroscopy under sedation but no such adverse effect was reported in our study.

Inspite of, our meticulous effort, our study lacks in few areas:

- In our trial, we did not study better marker of arterial oxygenation such as partial pressure of oxygen (PaO_2), we just relied on transcutaneous oxygen saturation measured by pulse oximetry (SpO_2).
- For measuring adequacy of ventilation, monitoring of end tidal carbon dioxide ($EtCO_2$), or partial pressure of carbon dioxide ($PaCO_2$) was not done. This can also be considered as disadvantage of using HFNC as monitoring end tidal CO_2 become problematic. As high flows of HFNC dilute the gases at hypopharynx making CO_2 sampling difficult.
- Our trial also did not include pediatric population and morbid obese patients so our results cannot guide practice in these patients.
- Although all the patients were randomly allocated to groups but blinding was not possible after device was applied so there might be some bias in subjective outcomes like patient satisfaction score and procedural discomfort.

Keeping all observations, comparisons and adverse effects in mind we inferred from our study that HFNC reduces the risk of desaturation under total intravenous anaesthesia and is a better oxygenating device than venturi mask.

SUMMARY AND CONCLUSION

The present study was conducted in the Department of Anaesthesiology, Dayanand Medical College and Hospital, Ludhiana after getting approval from the Institutional ethics committee. We performed “comparison of oxygenation using venturi mask and high flow nasal cannula in patients undergoing minor surgery under total intravenous anaesthesia”.

One hundred patients belonging to ASA grade I-II scheduled for minor surgery under total intravenous anaesthesia were studied in a randomized, double-blind manner after a written informed consent. The patients were randomly allocated into two groups of 50 patients each using computer generated random numbers to receive:

Group H: comprising of 50 patients, received high flow nasal oxygen using AIRVO at the rate of 50L/minute at 0.5 FiO_2.

Group V: comprising of 50 patients, received oxygen via Venturi mask at the rate of 6L/minute at 0.5 FiO_2

Total intravenous anaesthesia comprising of propofol, ketamine, fentanyl was given to patients of both groups and intraoperative hemodynamic parameters i.e., oxygen saturation, heart rate, systolic blood pressure,diastolic blood pressure and mean arterial pressure was recorded. At any point of time during intraoperative period when oxygen saturation declined to less than 90%, rescue airway manoeuvre/airway adjuncts or bag mask ventilation with 100% oxygen/intubation and ventilation was done.

We observed that both groups were demographically similar. Lesser number of patients in group H (24%) desaturated (SpO_2<90%) as compared to in group V (60%)patients, this result was more marked in patients with BMI>25kg/m^2. No statistically significant difference in hemodynamic parameters was observed during intraoperative and post operative period between two groups. Few patients reported discomfort in form of dryness of oral mucosa in venturi mask group but this difference was statistical insignificant when compared with HFNC group.

In conclusion, we recommend to extend the application of HFNC in operating room on spontaneously breathing patients under total intravenous anaesthesia. HFNC by decreasing the incidence and severity of intra-operative desaturation, increases the margin of safety as an oxygenating device as compared with venturi mask especially in patients with BMI> 25kg/m^2.

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KEY TO MASTER CHART

ASA	American Society of Anaesthesiologists
BM	Body Mass Index
DBP0	Diastolic Blood Pressure at 0 minute
DBP5	Diastolic Blood Pressure at 5 minutes
DBP10	Diastolic Blood Pressure at 10 minutes
DBP15	Diastolic Blood Pressure at 15 minutes
DBP20	Diastolic Blood Pressure at 20 minutes
HR0	Heart Rate at 0 minute
HR5	Heart Rate at 5 minutes
HR10	Heart Rate at 10 minutes
HR15	Heart Rate at 15 minutes
HR20	Heart Rate at 20 minutes
MPS	Malam Patti Scoring
MAP0	Mean Arterial Pressure at 0 minute
MAP5	Mean Arterial Pressure at 5 minutes
MAP10	Mean Arterial Pressure at 10 minutes
MAP15	Mean Arterial Pressure at 15 minutes
MAP20	Mean Arterial Pressure at 20 minutes
PHR0	Post Operative Heart Rate at 0 minute
PHR10	Post Operative Heart Rate at 10 minutes
PHR20	Post Operative Heart Rate at 20 minutes
PHR30	Post Operative Heart Rate at 30 minutes
PHR40	Post Operative Heart Rate at 40 minutes
PHR50	Post Operative Heart Rate at 50 minutes
PHR1	Post Operative Heart Rate at 1 hour
PHR1:10	Post Operative Heart Rate at 1 hour 10 minutes
PHR1:20	Post Operative Heart Rate at 1 hour 20 minutes
PHR1:30	Post Operative Heart Rate at 1 hour 30 minutes
PHR1:40	Post Operative Heart Rate at 1 hour 40 minutes
PHR1:50	Post Operative Heart Rate at 1 hour 50 minutes
PHR2	Post Operative Heart Rate at 2 hours
PSBP0	Post Operative Systolic BP at 0 minute
PSBP10	Post Operative Systolic BP at 10 minutes
PSBP20	Post Operative Systolic BP at 20 minutes
PSBP30	Post Operative Systolic BP at 30 minutes
PSBP40	Post Operative Systolic BP at 40 minutes
PSBP50	Post Operative Systolic BP at 50 minutes
PSBP1	Post Operative Systolic BP at 1 hour
PSBP1:10	Post Operative Systolic BP at 1 hour 10 minutes
PSBP1:20	Post Operative Systolic BP at 1 hour 20 minutes
PSBP1:30	Post Operative Systolic BP at 1 hour 30 minutes
PSBP1:40	Post Operative Systolic BP at 1 hour 40 minutes
PSBP1:50	Post Operative Systolic BP at 1 hour 50 minutes

PSBP2	Post Operative Systolic BP at 2 hours
PDBP0	Post Operative Diastolic BP at 0 minute
PDBP10	Post Operative Diastolic BP at 10 minutes
PDBP20	Post Operative Diastolic BP at 20 minutes
PDBP30	Post Operative Diastolic BP at 30 minutes
PDBP40	Post Operative Diastolic BP at 40 minutes
PDBP50	Post Operative Diastolic BP at 50 minutes
PDBP1	Post OperativeDiastolic BP at 1 hour.
PDBP1:10	Post OperativeDiastolic BP at1hour10 minutes
PDBP1:20	Post Operative Diastolic BP at 1 hour 20 minutes
PDBP1:30	Post OperativeDiastolic BP at1 hour 30 minutes
PDBP1:40	Post OperativeDiastolic BP at 1 hour 40 minutes
PDBP1:50	Post OperativeDiastolic BP at 1 hour 50 minutes
PDBP2	Post OperativeDiastolic BP at 2 hours.
PMAP0	Post Operative Mean Arterial Pressure at 0 minute
PMAP10	Post Operative Mean Arterial Pressure at 10minutes
PMAP20	Post Operative Mean Arterial Pressure at 20minutes
PMAP30	Post Operative Mean Arterial Pressure at30minutes
PMAP40	Post Operative Mean Arterial Pressure at40minutes
PMAP50	Post Operative Mean Arterial Pressure at50minutes
PMAP1	Post Operative Mean Arterial Pressure at 1 hour
PMAP1:10	Post Operative Mean Arterial Pressure at 1 hour 10 minutes
PMAP1:20	Post Operative Mean Arterial Pressure at 1 hour 20 minutes
PMAP1:30	Post Operative Mean Arterial Pressure at 1 hour 30 minutes
PMAP1:40	Post Operative Mean Arterial Pressure at 1 hour 40 minutes
PMAP1:50	Post Operative Mean Arterial Pressure at 1 hour 50 minutes
PMAP2	Post Operative Mean Arterial Pressure at 2 hours
PSAT0	Post Operative oxygen saturation at 0 minute
PSAT10	Post Operative oxygen saturation at 10 minutes
PSAT20	Post Operative oxygen saturation at 20 minutes
PSAT30	Post Operative oxygen saturation at 30 minutes
PSAT40	Post Operative oxygen saturation at 40 minutes
PSAT50	Post Operative oxygen saturation at 50 minutes
PSAT1	Post Operative oxygen saturation at 1 hour
PSAT1:10	Post Operative oxygen saturation at 1 hour 10 minutes
PSAT1:20	Post Operative oxygen saturation at 1 hour 20 minutes
PSAT1:30	Post Operative oxygen saturation at 1 hour 30 minutes
PSAT1:40	Post Operative oxygen saturation at 1hour 40minutes
PSAT1:50	Post Operative oxygen saturation at 1 hour 50 minutes
PSAT2	Post Operative oxygen saturation at 2 hours
SBP0	Systolic Blood Pressure at 0 minute
SBP5	Systolic Blood Pressure at 5 minutes
SBP10	Systolic Blood Pressure at 10 minutes
SBP15	Systolic Blood Pressure at 15 minutes
SBP20	Systolic Blood Pressure at 20 minutes

SAT0	Saturation at 0 minute
SAT5	Saturation at 5 minutes
SAT10	Saturation at 10 minutes
SAT15	Saturation at 15 minutes
SAT20	Saturation at 20 minutes
PMAP0	Post Operative Mean Arterial Pressure at 0 minute
PMAP10	Post Operative Mean Arterial Pressure at 10minutes
PMAP20	Post Operative Mean Arterial Pressure at 20minutes
PMAP30	Post Operative Mean Arterial Pressure at30minutes
PMAP40	Post Operative Mean Arterial Pressure at40minutes
PMAP50	Post Operative Mean Arterial Pressure at50minutes
PMAP1	Post Operative Mean Arterial Pressure at 1 hour
PMAP1:10	Post Operative Mean Arterial Pressure at 1 hour 10 minutes
PMAP1:20	Post Operative Mean Arterial Pressure at 1 hour 20 minutes
PMAP1:30	Post Operative Mean Arterial Pressure at 1 hour 30 minutes
PMAP1:40	Post Operative Mean Arterial Pressure at 1 hour 40 minutes
PMAP1:50	Post Operative Mean Arterial Pressure at 1 hour 50 minutes
PMAP2	Post Operative Mean Arterial Pressure at 2 hours
PSAT0	Post Operative oxygen saturation at 0 minute
PSAT10	Post Operative oxygen saturation at 10 minutes
PSAT20	Post Operative oxygen saturation at 20 minutes
PSAT30	Post Operative oxygen saturation at 30 minutes
PSAT40	Post Operative oxygen saturation at 40 minutes
PSAT50	Post Operative oxygen saturation at 50 minutes
PSAT1	Post Operative oxygen saturation at 1 hour
PSAT1:10	Post Operative oxygen saturation at 1 hour 10 minutes
PSAT1:20	Post Operative oxygen saturation at 1 hour 20 minutes
PSAT1:30	Post Operative oxygen saturation at 1 hour 30 minutes
PSAT1:40	Post Operative oxygen saturation at 1hour 40minutes
PSAT1:50	Post Operative oxygen saturation at 1 hour 50 minutes
PSAT2	Post Operative oxygen saturation at 2 hours
SBP0	Systolic Blood Pressure at 0 minute
SBP5	Systolic Blood Pressure at 5 minutes
SBP10	Systolic Blood Pressure at 10 minutes
SBP15	Systolic Blood Pressure at 15 minutes
SBP20	Systolic Blood Pressure at 20 minutes
SAT0	Saturation at 0 minute
SAT5	Saturation at 5 minutes
SAT10	Saturation at 10 minutes
SAT15	Saturation at 15 minutes
SAT20	Saturation at 20 minutes

S. NO	MRD	AGE	SEX	BMI	GROUP	ASA	MALLAMPATI CLASS	NECK MOVEMENT	THYROMENTAL DISTANCE	MOUTH OPENING	NECK CIRCUMFERENCE	DIAGNOSIS	PROCEDURE	Total amount of ketofol (ml)	total amount of propofol (mg)
1	1004768	18	M	24.2	H	1	1	UNRESTRICTED	>6.5	>3FB	36	haematuria	Check cystoscopy	7	63
2	789116	30	F	21.2	V	2	2	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	10	90
3	102265	40	F	33	H	1	2	UNRESTRICTED	>6.5	>3FB	32	Postmenopausal bleed	DILATATION & CURETTAGE	12	108
4	892663	32	F	22	V	1	2	UNRESTRICTED	>6.5	>3FB	31	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	16	144
5	989623	26	F	18.8	V	2	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	16	144
6	1130862	29	F	25	v	1	1	UNRESTRICTED	>6.5	>3FB	33	Fissure in ano	Lateral sphincterotomy	14	126
7	876927	25	M	23.3	V	1	1	UNRESTRICTED	>6.5	>3FB	32	Post micturition burning	Check cystoscopy	10	90
8	495398	38	F	24.2	H	2	2	UNRESTRICTED	>6.5	>3FB	34	Nephrolithiasis	B/L DJ STENTING	10	90
9	965947	38	F	27.2	H	2	2	UNRESTRICTED	>6.5	>3FB	30	Abnormal growth	Cervical biopsy	4	36
10	934519	40	F	29.3	V	2	2	UNRESTRICTED	>6.5	>3FB	30	Urethral obxtruction	Urethral dilatation and cystoscopy	9	81
11	615545	37	f	24.2	V	2	2	UNRESTRICTED	>6.5	>3FB	34	Heavy menstrual bleeding	DILATATION & CURETTAGE	8	72
12	902496	30	F	28.3	V	1	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	7	63
13	1012911	31	F	24.7	H	1	1	UNRESTRICTED	>6.5	>3FB	35	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	10	90
14	893425	28	F	23.3	V	2	2	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	6	54
15	1009056	28	F	22.2	H	1	1	UNRESTRICTED	>6.5	>3FB	36	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
16	896527	35	F	22.2	V	2	2	UNRESTRICTED	>6.5	>3FB	30	Anembroyonic pregnany	DILATATION & CURETTAGE	18	162
17	1014462	34	F	28	V	2	2	UNRESTRICTED	>6.5	>3FB	32	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
18	1031552	23	f	22.4	V	2	1	UNRESTRICTED	>6.5	>3FB	30	missed abortion	DILATATION & CURETTAGE	5	45
19	949730	36	M	24.7	H	2	2	UNRESTRICTED	>6.5	>3FB	32	F/U/C/O Fistulectomy	seton wire tightening	12	108
20	104876	30	F	23.4	H	2	2	UNRESTRICTED	>6.5	>3FB	34	F/U/C/O BLADDER CA	CYSTOSCOPY n procced	7	63
21	1051754	33	M	21.5	H	2	1	UNRESTRICTED	>6.5	>3FB	30	Closed fracture DER	CLOSED REDUCTION	14	126
22	1013210	41	F	25.4	V	1	2	UNRESTRICTED	>6.5	>3FB	28	POG 2 WEEKS	MTP	7	63
23	820315	36	M	21.8	H	2	1	UNRESTRICTED	>6.5	>3FB	35	HEMATURIA	Check cystoscopy	7	63
24	166630	28	F	25.2	V	2	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
25	951961	40	M	27.8	H	2	2	UNRESTRICTED	>6.5	>3FB	34	HEMATURIA	Check cystoscopy	8	72
26	1115721	24	M	35.9	H	1	2	UNRESTRICTED	>6.5	>3FB	32	f/c/o fissure in ano	seton wire tightening	10	90
27	1024831	30	F	26.6	V	1	2	UNRESTRICTED	>6.5	>3FB	28	Missed abortion	DILATATION & CURETTAGE	5	45
28	1022387	48	F	27.2	H	2	2	UNRESTRICTED	>6.5	>3FB	36	RENAL STONES	B/L DJ STENTING	12	108
29	1018080	33	F	23.7	H	1	1	UNRESTRICTED	>6.5	>3FB	31	P/O/C/O PERIANAL ABSCESS	SETON WIRE TIGHTENING	16	144
30	1008372	30	F	25	H	1	1	UNRESTRICTED	>6.5	>3FB	35	F/U/C/O FISTULECTOMY	SETON WIRE TIGHTENING	7	63
31	1034305	52	F	27.4	V	2	1	UNRESTRICTED	>6.5	>3FB	31	pyometra	pyometra drainage	7	63
32	997711	44	F	25.7	H	2	2	UNRESTRICTED	>6.5	>3FB	30	Post menopausal bleeding	Cervical biopsy	5	45
33	828212	46	F	28.9	H	2	2	UNRESTRICTED	>6.5	>3FB	32	F/U/C/O DJSTENT	DJ STENT REMOVAL AND CYSTOSCOPY	12	108
34	1118364	52	F	24.2	V	2	2	UNRESTRICTED	>6.5	>3FB	28	Mass coming from Vagina	cervical biopsy	5	45
35	1047739	42	M	24.2	H	2	2	UNRESTRICTED	>6.5	>3FB	30	Renal stones	DJ stenting	11	99
36	987665	28	F	25.2	V	1	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
37	1125642	35	F	29.2	V	2	2	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	6	54
38	540077	29	F	24.2	V	2	2	UNRESTRICTED	>6.5	>3FB	28	Heavy menstrual bleeding	DILATATION & CURETTAGE	8	72
39	1116444	31	F	32.5	V	2	2	UNRESTRICTED	>6.5	>3FB	32	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	12	108
40	1106124	26	M	22.8	H	1	2	UNRESTRICTED	>6.5	>3FB	28	Fissure in ano	seton wire tightening	12	108
41	408250	28	F	24.2	H	1	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	6	54
42	1008520	38	M	24.7	H	2	2	UNRESTRICTED	>6.5	>3FB	30	Bladder carcinoma	CYSTOSCOPY n procced	7	63
43	1069877	39	F	29	V	1	1	UNRESTRICTED	>6.5	>3FB	30	POF 2 WEEKS	MTP	7	63
44	893606	40	F	18.3	H	2	2	UNRESTRICTED	>6.5	>3FB	28	Bladder carcinoma	CYSTOSCOPY n procced	14	126
45	1006464	36	F	22.3	H	1	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	12	108
46	1043500	34	F	33.3	H	2	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	10	90
47	931138	30	F	27.3	H	1	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	6	54
48	1073226	20	F	22.7	V	1	1	UNRESTRICTED	>6.5	>3FB	32	missed abortion	DILATATION & CURETTAGE	9	81
49	1001201	25	F	23.4	V	1	1	UNRESTRICTED	>6.5	>3FB	28	BLIGHTED OVUM	DILATATION & CURETTAGE	5	45
50	978082	42	F	30.5	H	2	2	UNRESTRICTED	>6.5	>3FB	32	Post menopausal bleeding	DILATATION & CURETTAGE	9	81
51	1032621	30	F	25.4	V	1	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
52	1123487	43	F	26.5	V	1	1	UNRESTRICTED	>6.5	>3FB	34	Heavy menstrual bleed	DILATATION & CURETTAGE	8	72
53	1021244	52	F	21.5	H	2	1	UNRESTRICTED	>6.5	>3FB	28	Swelling on right hand	synivial biopsy	8	72

S. NO	MRD	total amount of ketamine (mg)	Need for airway manoeuvr	need for airway adjunct	need for intubation	complication	HR0	HR5	HR10	HR15	HR20	SBP0	SBP5	SBP10	SBP15	SBP20	DBP0	DBP5	DBP10	DB15	DBP20	MAP0	MAP5	MAP10	MAP15	MAP20	SAT0
1	1004768	28	no		no		82	96	95	107	97	112	114	109	120	111	73	76	65	78	70	86	89	80	92	84	99
2	789116	40	no		no		99	94	97	110	98	112	110	108	114	120	64	58	58	84	86	80	75	75	94	97	99
3	102265	48	yes		no	saturation drop below 90%	78	100	98	87	86	144	144	155	155	151	83	80	80	80	85	103	101	105	105	107	99
4	892663	64	yes	oral airway	no	saturation drop below 90%	113	136	138	135	133	112	132	126	117	116	78	88	75	70	81	89	103	92	86	93	98
5	989623	64	yes		no	saturation drop below 90%	88	110	109	112	130	120	130	105	98	148	72	69	68	56	94	88	89	80	70	112	100
6	1130862	56	yes		no	saturation drop below 90%	91	98	110	94	90	112	114	114	128	125	67	62	57	70	76	82	79	76	89	92	100
7	876927	40	yes		no	saturation drop below 90%	106	110	111	110	98	122	122	128	130	140	76	80	78	80	80	91	94	95	97	100	99
8	495398	40	yes		no	saturation drop below 90%	89	98	99	98	97	137	146	129	131	120	84	86	76	79	76	102	106	94	96	91	97
9	965947	16	no		no		88	80	80	82	84	142	150	148	140	138	92	98	88	82	80	109	115	108	101	99	99
10	934519	36	yes		no	saturation drop below 90%	88	118	116	110	98	142	131	113	128	126	70	79	72	80	82	94	96	86	96	97	99
11	615545	32	no		no		78	98	110	110	100	112	102	112	120	130	80	78	88	80	80	91	86	96	93	97	100
12	902496	28	yes		no	saturation drop below 90%	84	100	110	100	99	110	112	122	130	130	60	70	88	80	88	77	84	99	97	102	100
13	1012911	40	no		no		98	100	102	100	98	130	138	140	138	128	88	90	92	88	78	102	106	108	105	95	99
14	893425	24	no		no		95	92	102	109	110	122	121	122	125	130	90	83	85	87	88	101	96	97	100	102	100
15	1009056	32	no		no		106	110	108	100	102	120	120	128	120	118	78	80	78	82	78	92	93	95	95	91	99
16	896527	72	yes		no	saturation drop below 90%	78	82	99	100	98	142	128	120	124	130	88	84	70	78	70	106	99	87	93	90	100
17	1014462	32	no		no		86	88	97	98	96	121	105	111	110	118	61	58	55	60	78	81	74	74	77	91	100
18	1031552	20	no		no		64	65	66	75	66	123	109	109	107	103	75	64	63	61	58	91	79	78	76	73	100
19	949730	48	yes		no	saturation drop below 90%	90	98	96	94	90	136	131	149	134	149	87	82	92	81	85	103	98	111	99	106	100
20	104876	28	no		no		89	84	83	81	78	115	117	104	100	102	67	62	56	54	55	83	80	72	69	71	99
21	1051754	56	no		no		100	92	96	98	98	140	140	138	140	138	88	88	78	80	78	105	105	98	100	98	96
22	1013210	28	no		no		110	117	98	100	102	102	110	112	112	110	60	60	60	86	80	74	77	77	95	90	100
23	820315	28	yes		no	saturation drop below 90%	69	88	80	74	78	130	100	103	110	126	78	60	70	70	85	95	73	81	83	99	99
24	166630	32	yes		no	saturation drop below 90%	100	101	106	100	98	116	128	128	131	117	64	75	79	87	77	81	93	95	102	90	98
25	951961	32	yes		no	saturation drop below 90%	66	80	82	69	66	164	112	112	115	127	79	75	73	78	84	107	87	86	90	98	100
26	1115721	40	yes		no	saturation drop below 90%	70	92	97	70	90	132	147	126	126	131	82	103	85	100	97	99	118	99	109	108	100
27	1024831	20	yes		no	saturation drop below 90%	72	80	100	92	90	122	130	132	130	128	82	90	88	86	88	95	103	103	101	101	99
28	1022387	48	no		no		99	100	109	108	106	153	144	165	165	160	105	109	118	122	112	121	121	134	136	128	100
29	1018080	64	no		no		78	105	103	96	91	112	120	114	112	108	78	67	59	62	56	89	85	77	79	73	100
30	1008372	28	no		no		88	89	93	89	91	116	129	113	109	107	78	77	75	65	63	91	94	88	80	78	100
31	1034305	28	yes		no	saturation drop below 90%	66	88	78	76	80	157	139	128	120	135	99	87	86	85	84	118	104	100	97	101	98
32	997711	20	no		no		68	70	78	80	72	120	128	130	128	120	88	60	80	78	82	99	83	97	95	95	99
33	828212	48	no		no		88	86	88	88	86	140	139	139	143	140	99	99	90	95	88	113	112	106	111	105	98
34	1118364	20	no		no		68	70	82	88	80	142	152	154	148	140	90	98	100	92	96	107	116	118	111	111	98
35	1047739	44	no		no		88	86	89	89	90	110	116	118	110	106	60	54	62	72	66	77	75	81	85	79	99
36	987665	32	yes		no	saturation drop below 90%	100	101	106	96	98	132	134	132	132	128	90	98	88	70	80	104	110	103	91	96	96
37	1125642	24	yes	bag n mask ventilation	no	saturation drop below 90%	112	115	106	98	90	111	118	120	108	110	70	77	79	80	72	84	91	93	89	85	98
38	540077	32	no		no		100	99	108	100	92	132	130	134	138	128	88	80	88	90	76	103	97	103	106	93	99
39	1116444	48	yes		no	saturation drop below 90%	100	110	108	98	98	150	152	150	146	140	92	90	88	90	88	111	111	109	109	105	98
40	1106124	48	no		no		62	76	74	64	66	140	136	152	155	140	84	82	85	84	80	103	100	107	108	100	100
41	408250	24	no		no		108	109	118	100	99	108	104	108	105	126	72	66	58	62	77	84	79	75	76	93	100
42	1008520	28	no		no		95	92	92	93	93	132	127	125	132	131	86	83	81	82	84	101	98	96	99	100	99
43	1069877	28	no		no		72	86	87	100	70	128	144	149	126	131	88	98	103	85	87	101	113	118	99	102	98
44	893606	56	no		no		100	99	95	96	94	122	119	113	116	113	74	99	73	73	71	90	106	86	87	85	98
45	1006464	48	no		no		100	88	87	99	90	100	105	108	99	112	64	69	65	64	72	76	81	79	76	85	96
46	1043500	40	yes		no	saturation drop below 90%	88	100	102	98	96	130	140	138	136	132	88	90	90	88	78	102	107	106	104	96	96
47	931138	24	no		no		98	100	107	106	100	130	140	138	130	132	80	100	98	80	78	97	113	111	97	96	99
48	1073226	36	no		no		62	64	58	76	70	112	130	138	125	120	60	66	70	84	72	77	87	93	98	88	99
49	1001201	20	yes		no	saturation drop below 90%	98	110	106	100	98	112	102	112	112	116	60	60	62	68	70	77	74	79	83	85	98
50	978082	36	yes		no	saturation drop below 90%	88	98	92	90	96	140	148	150	144	128	88	90	99	88	90	105	109	116	107	103	99
51	1032621	32	no		no		72	88	70	72	76	122	132	112	116	120	76	88	76	89	78	91	103	88	98	92	99
52	1123487	32	yes		no	saturation drop below 90%	107	110	98	92	90	132	135	132	130	147	80	84	70	88	90	97	101	91	102	109	99
53	1021244	32	no		no		88	85	104	102	100	128	142	145	110	148	70	75	78	78	83	89	97	100	89	105	100

S. NO	MRD	SAT5	SAT10	SAT15	SAT20	PHR0	PHR10	PHR20	PHR30	PHR40	PHR50	PHR1	PHR1:10	PHR1:20	PHR1:30	PHR1:40	PHR1:50	PHR2	PSBP0	PSBP10	PSBP20	PSBP30	PSBP40	PSBP50	PSBP1	PSBP1:10	PSBP1:20	PSBP1:30
1	1004768	99	100	100	100	89	88	90	70	82	76	70	100	99	95	93	92	86	110	112	109	126	126	112	123	120	124	122
2	789116	99	99	100	100	95	98	92	94	94	90	88	100	102	100	98	96	96	120	122	127	120	122	120	118	110	116	120
3	102265	94	90	96	98	80	78	99	98	90	92	80	99	96	93	90	86	85	120	122	142	130	128	120	130	132	130	128
4	892663	96	88	96	97	100	98	99	94	92	96	98	94	92	87	85	81	77	125	128	121	124	126	122	122	130	126	124
5	989623	99	90	94	100	110	98	92	98	92	88	80	94	96	94	90	92	90	130	128	123	120	118	122	120	120	124	126
6	1130862	96	90	94	99	76	72	68	74	70	72	70	96	100	92	90	84	81	120	122	123	120	128	122	126	130	128	130
7	876927	90	94	96	99	120	116	118	110	100	98	98	96	94	92	91	90	89	128	130	131	128	130	122	132	130	128	126
8	495398	94	87	91	98	90	98	92	95	90	88	85	92	89	86	82	78	76	126	130	130	120	130	128	136	120	122	124
9	965947	99	99	99	99	82	80	78	76	78	80	80	96	95	94	91	90	85	128	128	138	140	138	136	138	128	126	126
10	934519	99	89	91	96	106	98	96	96	98	92	88	79	77	77	78	77	76	120	118	121	118	122	116	124	120	128	118
11	615545	98	96	97	98	100	78	92	90	90	92	90	85	85	84	84	82	82	120	120	111	112	112	122	112	130	128	126
12	902496	98	90	94	96	98	92	92	90	90	88	80	98	98	96	90	86	79	110	106	107	112	110	108	110	110	112	108
13	1012911	99	98	98	98	88	86	80	72	70	72	74	84	85	84	82	82	80	120	120	118	116	118	120	118	120	122	122
14	893425	100	100	100	100	89	80	72	70	72	70	70	98	96	95	94	96	95	110	110	107	112	122	108	110	110	122	120
15	1009056	98	98	98	98	90	88	80	80	78	78	70	76	72	70	68	64	60	120	118	116	118	120	122	124	128	126	124
16	896527	96	90	95	96	106	98	90	88	88	80	74	70	68	64	70	90	86	128	120	119	122	118	132	122	122	124	120
17	1014462	100	100	100	100	90	88	80	72	74	72	70	82	78	74	70	68	65	110	120	113	112	108	112	114	120	117	115
18	1031552	100	99	98	99	70	72	74	70	68	64	68	66	70	68	66	70	64	110	108	107	112	110	112	112	116	118	110
19	949730	100	90	98	99	87	82	80	78	76	72	74	86	82	80	76	72	68	132	130	128	124	126	122	118	122	120	118
20	104876	98	98	99	99	80	76	72	74	70	72	70	70	72	76	74	70	68	120	110	110	110	106	110	110	136	132	134
21	1051754	98	98	100	99	90	92	88	86	80	80	82	98	98	88	86	84	80	130	122	128	132	132	130	130	128	124	126
22	1013210	100	99	98	98	110	98	90	72	86	80	82	87	85	82	77	73	69	120	110	111	112	119	116	124	122	124	120
23	820315	94	92	100	100	79	80	78	79	75	76	78	88	91	88	84	92	90	110	120	126	130	130	128	126	126	122	120
24	166630	98	92	90	96	90	92	88	76	70	72	70	95	92	87	83	80	76	120	126	129	122	128	130	122	121	118	118
25	951961	92	89	95	99	70	72	76	70	70	72	70	72	70	72	68	76	77	120	130	120	128	120	120	128	126	128	126
26	1115721	90	96	98	98	80	94	95	97	99	95	88	79	78	76	78	75	74	124	128	129	130	127	128	124	122	120	118
27	1024831	98	94	96	98	98	92	90	88	86	80	72	72	95	93	90	85	81	120	116	113	112	112	108	112	112	116	120
28	1022387	100	100	100	100	98	80	82	88	70	78	80	70	70	68	70	72	76	122	124	128	126	128	124	122	126	128	126
29	1018080	100	100	100	100	70	72	68	76	70	74	70	90	88	89	86	85	84	122	124	119	112	122	124	117	122	120	118
30	1008372	100	100	100	100	90	92	88	86	84	78	72	95	89	86	83	79	75	112	123	118	119	114	103	124	120	118	120
31	1034305	96	92	96	98	82	84	86	80	82	80	88	75	76	70	74	70	69	128	130	129	128	126	124	128	120	122	124
32	997711	99	99	99	99	68	66	62	68	66	68	68	66	68	65	66	60	62	120	128	126	130	124	120	122	128	122	124
33	828212	97	97	96	96	90	92	88	86	88	84	82	99	105	98	95	91	83	130	128	126	126	122	118	120	122	118	116
34	1118364	98	96	96	98	68	66	60	62	64	66	60	70	78	75	74	72	70	128	128	127	130	128	126	124	136	132	132
35	1047739	98	98	98	100	84	86	86	88	82	82	86	98	98	96	96	94	92	126	124	122	128	126	120	126	128	122	124
36	987665	94	90	98	100	90	92	88	76	70	72	70	75	75	72	72	71	70	120	126	129	122	128	130	122	120	124	122
37	1125642	96	88	96	96	100	102	92	90	96	92	98	70	108	106	102	100	98	110	120	119	118	110	112	110	110	106	108
38	540077	98	96	98	98	92	90	88	80	70	72	70	84	89	82	76	74	72	120	118	117	120	120	122	124	111	108	116
39	1116444	90	94	98	96	90	88	86	80	76	74	76	84	83	82	81	80	81	128	126	123	130	122	122	128	136	134	134
40	1106124	99	98	99	98	78	80	82	80	68	72	70	80	74	70	65	61	70	120	120	122	126	122	124	122	131	128	125
41	408250	98	99	99	98	110	108	106	100	98	98	90	87	95	91	86	83	78	120	116	110	120	118	116	118	145	140	136
42	1008520	98	99	99	99	94	95	92	90	88	80	80	80	98	93	88	84	81	124	126	128	122	124	122	124	130	128	126
43	1069877	98	97	97	98	83	80	84	88	82	78	76	90	82	83	84	82	82	122	123	125	130	122	122	124	120	118	116
44	893606	98	100	99	99	90	88	80	82	80	80	82	96	95	96	95	89	88	116	112	116	118	120	118	116	112	114	116
45	1006464	97	99	99	100	80	88	82	80	88	80	82	86	85	84	86	85	82	116	120	118	108	106	110	110	112	114	116
46	1043500	92	96	98	98	90	88	80	78	74	72	72	80	86	85	82	84	80	122	120	126	124	120	120	122	120	128	130
47	931138	100	100	99	99	98	96	92	90	92	90	92	102	100	98	97	96	95	130	128	120	130	130	130	128	122	124	126
48	1073226	98	98	98	98	92	72	70	68	62	64	66	104	106	97	93	88	86	124	124	127	133	130	132	128	122	122	126
49	1001201	90	96	98	98	90	88	80	82	80	82	80	86	90	85	81	78	74	128	122	127	126	128	124	130	122	126	122
50	978082	94	90	96	98	94	98	92	90	90	92	90	102	100	98	99	98	97	122	120	128	130	140	136	130	132	128	126
51	1032621	99	98	98	98	78	80	70	72	72	70	68	90	89	85	82	86	84	120	110	113	118	122	122	124	128	129	126
52	1123487	96	90	98	98	98	90	92	80	82	76	87	84	80	78	79	80	79	130	120	127	126	130	128	132	136	134	135
53	1021244	100	100	100	100	98	92	90	92	98	98	92	73	70	67	63	60	64	130	136	132	130	136	132	132	128	125	121

S. NO	MRD	PSBP1:40	PSBP1:50	PSBP2	PDBP0	PDBP10	PDBP20	PDBP30	PDBP40	PDBP50	PDBP1	PDBP1:10	PDBP1:20	PDBP1:30	PDBP1:40	PDBP1:50	PDBP2	PMAP0	PMAP10	PMAP20	PMAP30	PMAP40	PMAP50	PMAP1	PMAP1:10
1	1004768	120	125	122	80	74	74	85	78	66	88	84	82	80	76	78	75	90	86	85	98	94	81	99	96
2	789116	122	126	122	70	68	60	68	60	64	60	70	77	70	80	77	70	87	86	82	84	81	83	78	83
3	102265	126	124	122	74	75	85	80	81	77	80	82	80	78	75	72	70	89	90	104	96	97	91	96	99
4	892663	120	118	116	74	78	88	90	78	80	78	80	78	76	74	72	70	91	94	98	99	93	93	93	97
5	989623	120	128	120	80	70	78	74	82	76	70	72	78	72	80	75	76	96	89	92	87	93	90	87	88
6	1130862	126	122	118	72	80	84	76	78	82	72	94	91	90	86	84	82	88	94	96	88	95	94	89	106
7	876927	124	124	120	80	90	80	78	78	80	76	72	78	74	70	72	70	96	103	96	92	94	93	95	91
8	495398	126	124	120	88	88	86	84	81	81	76	70	72	74	70	72	70	100	102	100	96	97	97	96	86
9	965947	124	124	124	88	90	88	90	85	81	80	75	76	76	75	74	73	100	98	96	99	94	92	99	93
10	934519	116	118	122	80	80	80	90	80	78	88	70	71	70	72	74	76	93	92	93	98	93	91	100	87
11	615545	128	124	126	80	88	78	82	80	70	70	72	74	78	72	74	78	93	98	88	92	91	86	83	91
12	902496	110	112	110	80	70	80	62	78	80	78	72	72	70	64	68	66	90	82	88	77	89	88	89	85
13	1012911	120	118	116	88	80	72	70	79	79	82	84	82	80	84	80	78	98	93	87	85	92	93	94	96
14	893425	118	116	112	69	60	78	72	80	78	80	82	86	87	84	80	80	82	76	88	85	93	87	89	91
15	1009056	122	120	118	80	78	80	72	81	79	80	82	80	76	72	70	72	93	91	92	87	95	93	95	97
16	896527	118	110	122	80	78	78	82	74	80	76	98	96	94	92	90	92	96	92	91	93	89	96	91	106
17	1014462	113	110	114	78	80	72	72	68	70	80	74	72	70	72	70	72	88	93	85	83	81	83	90	90
18	1031552	112	108	112	68	72	70	62	72	60	68	70	72	74	68	70	70	82	84	82	76	85	76	83	85
19	949730	116	114	116	79	86	72	80	77	79	78	80	82	78	75	72	70	96	100	90	94	93	93	91	94
20	104876	135	134	128	80	72	68	70	79	75	70	74	72	70	72	70	68	93	84	82	83	88	87	83	95
21	1051754	122	126	124	88	80	88	80	77	87	80	82	80	79	77	76	70	102	94	102	97	95	101	96	98
22	1013210	120	122	124	88	70	72	90	80	86	84	80	78	76	75	73	71	98	83	85	95	93	96	97	94
23	820315	118	128	122	80	70	86	78	87	78	79	76	72	76	78	82	76	90	86	99	96	94	92	94	93
24	166630	120	110	112	78	88	88	74	80	72	78	70	72	74	64	63	62	92	100	101	90	95	90	93	87
25	951961	128	126	122	88	82	76	80	59	77	70	78	76	76	70	74	72	98	98	90	96	79	91	89	94
26	1115721	128	120	122	80	80	84	83	83	81	79	72	76	78	80	82	80	94	96	99	98	96	94	94	88
27	1024831	118	116	118	80	72	80	84	80	72	70	74	72	71	69	67	65	94	86	90	91	91	83	83	86
28	1022387	124	122	126	88	83	83	80	81	83	86	90	89	88	86	84	82	99	96	98	95	97	97	98	102
29	1018080	116	122	120	79	78	83	67	84	87	72	78	76	73	72	70	70	93	93	95	82	97	99	87	92
30	1008372	116	112	118	70	80	80	74	76	67	80	80	87	85	83	81	78	84	94	93	89	89	79	94	93
31	1034305	118	116	112	80	76	82	82	88	84	86	86	82	84	84	86	80	96	94	97	95	101	96	99	97
32	997711	120	118	116	88	82	80	78	83	87	84	86	80	82	80	78	78	98	97	95	96	97	98	96	100
33	828212	120	122	118	90	88	88	90	87	79	72	70	72	76	74	68	74	103	101	100	102	99	92	88	87
34	1118364	130	128	126	88	86	84	80	86	82	88	76	80	74	74	76	75	101	100	98	95	100	97	99	96
35	1047739	120	118	116	80	90	93	97	87	81	87	90	90	88	84	85	86	95	101	102	107	101	94	100	102
36	987665	124	120	122	78	88	88	74	80	72	80	80	79	75	76	74	70	92	100	101	90	95	90	93	93
37	1125642	112	116	110	70	76	74	72	68	70	72	90	86	85	88	84	82	94	90	88	85	81	83	85	96
38	540077	110	112	114	80	72	80	78	72	88	74	84	80	76	74	70	68	94	87	92	92	87	98	91	93
39	1116444	130	132	130	90	88	72	82	72	88	70	80	78	76	75	76	79	102	100	88	98	89	99	88	98
40	1106124	122	119	117	78	88	80	78	79	77	80	94	92	90	88	86	83	92	98	94	94	93	93	94	106
41	408250	132	128	125	88	78	88	72	77	71	70	90	88	86	84	82	80	98	90	95	88	91	86	86	108
42	1008520	124	122	120	78	88	88	72	87	79	88	78	74	76	72	70	72	93	100	101	88	99	93	100	95
43	1069877	112	118	120	80	83	83	86	88	87	78	80	78	79	78	77	76	94	96	96	98	98	89	92	93
44	893606	118	120	122	88	72	80	78	79	71	72	78	74	72	76	74	70	97	85	92	91	93	87	86	89
45	1006464	118	116	118	70	80	88	80	67	77	82	84	85	84	83	82	81	85	93	98	89	80	88	91	93
46	1043500	127	129	128	90	88	72	80	87	69	82	82	82	80	78	76	75	100	99	90	95	98	87	95	94
47	931138	128	120	138	80	86	88	80	79	77	82	100	98	96	94	94	90	96	100	99	96	96	95	97	107
48	1073226	122	126	124	88	75	85	89	79	74	68	97	96	94	92	90	88	100	91	98	102	95	93	87	105
49	1001201	120	122	124	78	80	82	90	82	80	78	91	88	86	84	82	80	94	94	96	102	96	95	94	101
50	978082	122	120	120	88	90	88	80	89	79	88	76	75	74	70	72	74	99	100	101	96	106	98	102	94
51	1032621	124	126	123	78	88	68	72	80	72	88	82	82	80	81	82	80	92	95	83	85	93	89	99	97
52	1123487	136	135	134	92	90	87	88	87	80	83	89	88	86	85	84	86	104	100	100	99	100	95	98	104
53	1021244	117	114	111	88	80	88	88	79	79	72	82	78	76	74	72	70	102	98	103	102	98	97	92	97

S. NO	MRD	PMAP1:20	PMAP1:30	PMAP1:40	PMAP1:50	PMAP2	PSAT0	PSAT10	PSAT20	PSAT30	PSAT40	PSAT50	PSAT1	PSAT1:10	PSAT1:20	PSAT1:30	PSAT1:40	PSAT1:50	PSAT2	Patients satisfaction score
1	1004768	96	94	90	94	91	100	100	100	100	100	100	100	100	100	100	100	100	100	4
2	789116	90	86	94	93	87	99	100	100	100	100	100	100	100	100	100	100	100	100	4
3	102265	96	95	92	89	88	99	99	99	98	99	99	99	99	99	99	99	99	99	3
4	892663	94	92	90	87	85	98	99	98	98	96	96	96	99	99	99	99	99	99	3
5	989623	93	90	93	93	91	100	100	100	100	100	100	100	99	98	98	98	98	98	4
6	1130862	103	103	99	97	94	100	99	99	99	99	99	99	99	99	99	99	99	99	3
7	876927	95	91	88	89	86	100	100	100	100	100	100	100	99	98	98	98	98	98	3
8	495398	88	91	87	89	86	98	98	98	98	99	99	99	99	99	99	99	99	99	4
9	965947	92	92	91	90	90	99	99	99	99	99	99	99	99	99	99	99	99	99	4
10	934519	90	86	87	88	91	98	98	100	100	100	98	98	99	99	99	99	99	99	3
11	615545	92	94	91	90	94	98	98	99	100	100	100	100	99	99	99	99	99	99	3
12	902496	85	83	79	83	80	98	98	100	100	100	100	100	99	99	99	99	99	99	4
13	1012911	95	94	96	93	91	97	99	99	99	99	99	99	99	99	99	99	99	99	3
14	893425	98	98	95	92	90	100	100	100	100	100	100	100	99	99	99	99	99	99	3
15	1009056	95	92	88	87	87	99	99	99	99	99	99	99	99	99	99	99	99	99	4
16	896527	105	103	100	97	102	98	98	98	99	98	99	99	99	99	99	99	99	99	4
17	1014462	87	85	85	83	86	100	100	100	100	100	100	100	99	99	99	99	99	99	3
18	1031552	87	86	83	83	84	98	99	96	98	98	98	98	99	99	99	99	99	99	4
19	949730	94	91	88	86	85	100	100	100	100	100	100	100	99	99	99	99	99	99	3
20	104876	92	92	93	91	88	96	99	99	98	99	99	99	99	99	99	99	99	99	4
21	1051754	95	95	92	93	88	99	99	99	99	99	99	99	99	99	99	99	99	99	3
22	1013210	93	91	90	89	88	99	99	98	98	96	98	96	99	99	99	99	99	99	4
23	820315	88	91	91	97	91	99	96	97	97	96	97	98	99	99	99	99	99	99	3
24	166630	87	88	83	78	78	100	100	100	100	100	100	100	99	99	99	99	99	99	4
25	951961	93	92	90	91	88	99	100	100	99	98	99	99	99	98	98	98	98	98	3
26	1115721	90	92	96	94	94	99	99	99	99	99	99	99	99	98	99	99	99	99	4
27	1024831	86	87	85	83	82	99	99	98	99	99	99	99	99	98	99	99	99	99	3
28	1022387	102	100	99	96	96	100	100	100	100	100	100	100	99	98	99	99	99	99	3
29	1018080	90	88	86	87	86	99	99	98	99	98	99	99	99	98	99	99	99	99	4
30	1008372	97	96	94	91	91	100	100	100	100	100	100	100	99	98	99	99	99	99	3
31	1034305	95	97	95	96	90	99	98	98	98	98	98	99	99	98	99	99	99	99	4
32	997711	94	96	93	92	91	99	99	99	99	99	99	99	99	98	99	99	99	99	4
33	828212	87	90	89	86	88	96	98	98	98	98	99	98	99	98	99	99	99	99	4
34	1118364	97	93	93	93	92	96	96	98	98	98	98	98	99	98	99	99	99	99	4
35	1047739	100	100	96	96	96	100	100	100	100	100	100	100	99	98	99	99	99	99	3
36	987665	94	90	92	89	87	100	100	100	100	100	100	100	99	98	99	99	99	99	4
37	1125642	92	92	96	94	92	99	99	99	99	99	99	99	99	98	99	99	99	99	4
38	540077	89	90	86	84	83	99	99	99	99	99	99	99	99	98	99	99	99	99	4
39	1116444	96	95	93	94	96	99	99	99	99	99	99	99	99	98	99	99	99	99	3
40	1106124	104	101	99	97	95	98	99	99	99	99	99	100	99	98	99	99	99	99	4
41	408250	106	102	100	97	95	99	99	99	99	99	99	99	99	98	99	99	99	99	3
42	1008520	92	93	89	87	88	99	99	99	99	99	99	99	99	98	99	99	99	99	4
43	1069877	92	92	89	90	90	98	98	99	99	99	99	99	99	98	99	99	99	99	3
44	893606	87	86	90	89	87	99	99	99	99	99	99	99	99	98	99	99	99	99	4
45	1006464	95	95	95	93	93	99	100	100	100	100	100	100	99	98	99	99	99	99	4
46	1043500	97	96	94	94	92	99	99	99	99	99	99	99	99	98	99	99	99	99	3
47	931138	107	106	105	103	106	99	99	99	99	99	99	99	99	98	98	98	98	98	3
48	1073226	105	104	102	102	100	99	100	100	100	100	100	100	99	98	100	100	100	100	4
49	1001201	0	98	96	95	95	98	98	98	98	98	98	98	99	98	100	100	100	100	4
50	978082	92	92	87	88	89	99	99	98	99	98	98	99	99	98	100	100	100	100	3
51	1032621	97	95	95	96	94	99	99	99	99	99	99	99	99	98	100	100	100	100	4
52	1123487	103	102	102	101	102	98	99	99	99	99	99	99	99	98	100	100	100	100	3
53	1021244	93	91	88	86	83	99	99	99	99	99	99	99	99	98	100	100	100	100	3

S. NO	MRD	AGE	SEX	BMI	GROUP	ASA	MALLAMPATI CLASS	NECK MOVEMENT	THYROMENTAL DISTANCE	MOUTH OPENING	NECK CIRCUMFERENCE	DIAGNOSIS	PROCEDURE	Total amount of ketofol (ml)	total amount of propofol (mg)
54	1044680	26	F	25	V	1	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	9	81
55	1007346	28	F	21.7	V	1	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	CONE BX WITH DNC	6	54
56	103210	41	F	26.4	V	2	2	UNRESTRICTED	>6.5	>3FB	30	MTP	DILATATION & CURETTAGE	8	72
57	1023662	24	F	19.9	V	1	1	UNRESTRICTED	>6.5	>3FB	34	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
58	1018080	33	F	23.7	H	1	1	UNRESTRICTED	>6.5	>3FB	30	F/U/C/0 FISSURE IN ANO	seton wire removal	13	117
59	1000580	26	F	24.9	H	1	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	10	90
60	976111	30	F	23.4	H	1	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	14	126
61	996263	50	F	29	H	2	1	UNRESTRICTED	>6.5	>3FB	28	pyometra	pyometra drainage	11	99
62	863428	29	F	26.5	V	2	2	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	12	108
63	1079063	34	F	29.3	V	1	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	6	54
64	1038387	25	F	27.9	V	1	1	UNRESTRICTED	>6.5	>3FB	34	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	10	90
65	1040219	45	F	31.5	V	1	1	UNRESTRICTED	>6.5	>3FB	34	CERVICAL GROWTH	CERVICAL biopsy	12	108
66	768254	48	F	28.8	H	2	2	UNRESTRICTED	>6.5	>3FB	32	Haematuria	CYSTOSCOPY n procced	10	90
67	920940	38	F	17.2	H	2	2	UNRESTRICTED	>6.5	>3FB	28	Nephrolithiasis	B/L DJ STENTING	12	108
68	934265	32	M	22	H	1	1	UNRESTRICTED	>6.5	>3FB	32	Haematuria	check cystoscopy	10	90
69	495380	28	F	25.4	H	1	2	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
70	839966	26	F	26.6	V	1	2	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
71	1036629	39	M	26.5	V	2	2	UNRESTRICTED	>6.5	>3FB	34	hematuria	CYSTOSCOPY n procced	4	36
72	1064771	23	F	26.1	V	1	1	UNRESTRICTED	>6.5	>3FB	34	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	10	90
73	814004	32	F	25	H	1	1	UNRESTRICTED	>6.5	>3FB	28	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	7	63
74	484198	28	F	27.2	H	1	1	UNRESTRICTED	>6.5	>3FB	34	MTP	DILATATION & CURETTAGE	8	72
75	1077869	32	F	26.5	V	1	2	UNRESTRICTED	>6.5	>3FB	34	missed abortion	DILATATION & CURETTAGE	8	72
76	1023396	53	F	22.5	V	2	2	UNRESTRICTED	>6.5	>3FB	30	heavy menstrual bleeding	DILATATION & CURETTAGE and cone biopsy	6	54
77	713176	48	M	29.1	V	1	1	UNRESTRICTED	>6.5	>3FB	34	F/U/C/O EXTERNAL FIXATOR TIBIA	VAC APPLICATION	14	126
78	1024831	30	F	27.4	V	1	1	UNRESTRICTED	>6.5	>3FB	30	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	10	90
79	1210219	29	F	26.2	V	1	1	UNRESTRICTED	>6.5	>3FB	34	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	6	54
80	192760	32	F	26.6	H	1	1	UNRESTRICTED	>6.5	>3FB	30	missed abortion	DILATATION & CURETTAGE	8	72
81	4336	46	F	31.5	H	2	2	UNRESTRICTED	>6.5	>3FB	32	Abnormal growth	biopsy and EUA	14	126
82	888776	31	F	27.2	H	2	2	UNRESTRICTED	>6.5	>3FB	37	Fissure in ano	seton wire tightening	12	108
83	484198	48	F	28	H	2	2	UNRESTRICTED	>6.5	>3FB	32	heavy menstrual bleeding endometrisl sampling	endometrial sampling	11	99
84	1029609	48	M	25.5	H	2	2	UNRESTRICTED	>6.5	>3FB	38	implant in situ	k wire removal	14	126
85	1026153	37	F	37.2	H	2	2	UNRESTRICTED	>6.5	>3FB	34	heavy menstrual bleeding	endometrial biopsy	9	81
86	1068942	42	M	29.1	V	2	2	UNRESTRICTED	>6.5	>3FB	38	f/c/o fissure in ano	seton wire tightening	12	108
87	103866	45	M	23.4	H	2	2	UNRESTRICTED	>6.5	>3FB	32	fracture metacarpal	k wire removal	12	108
88	1091982	35	F	29.3	V	1	2	UNRESTRICTED	>6.5	>3FB	36	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	7	63
89	1093251	27	F	27.1	V	1	1	UNRESTRICTED	>6.5	>3FB	34	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	12	108
90	110945	40	F	28.8	H	2	1	UNRESTRICTED	>6.5	>3FB	34	cervical growth	cervical biopsy	8	72
91	1114681	30	F	24.2	V	1	1	UNRESTRICTED	>6.5	>3FB	28	Heavy menstrual bleeding	endometrial biopsy	5	45
92	7824	35	F	27.6	V	1	1	UNRESTRICTED	>6.5	>3FB	28	missed abortion	DILATATION & CURETTAGE	7	63
93	337556	32	F	30.5	H	1	2	UNRESTRICTED	>6.5	>3FB	34	missed abortion	DILATATION & CURETTAGE	12	108
94	1042808	45	F	36.5	H	2	2	UNRESTRICTED	>6.5	>3FB	36	heavy menstrual bleeding	d n c plu biopsy	8	72
95	931138	30	F	26	H	1	1	UNRESTRICTED	>6.5	>3FB	34	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	5	45
96	1032404	26	M	26.1	V	1	2	UNRESTRICTED	>6.5	>3FB	36	Fissure in ano	seton wire tightening	14	126
97	679712	44	F	17.5	H	2	1	UNRESTRICTED	>6.5	>3FB	28	pain abdomen	ERCP	8	72
98	1014468	34	F	21.7	V	1	2	UNRESTRICTED	>6.5	>3FB	36	RETAINED PRODUCT OF CONCEPTION	DILATATION & CURETTAGE	8	72
99	337556	32	F	30.5	H	1	2	UNRESTRICTED	>6.5	>3FB	34	missed abortion	DILATATION & CURETTAGE	10	90
100	1033875	48	F	30.6	V	2	2	UNRESTRICTED	>6.5	>3FB	32	pyometra	PUS drainage	14	126

S. NO	MRD	total amount of ketamine (mg)	Need for airway manoeuvr	need for airway adjunct	need for intubation	complication	HR0	HR5	HR10	HR15	HR20	SBP0	SBP5	SBP10	SBP15	SBP20	DBP0	DBP5	DBP10	DB15	DBP20	MAP0	MAP5	MAP10	MAP15	MAP20	SAT0
54	1044680	36	yes		no	saturation drop below 90%	70	74	84	83	82	122	118	124	124	126	65	58	57	66	72	84	78	79	85	90	100
55	1007346	24	no		no		72	78	80	82	86	112	111	114	108	118	80	74	75	79	83	91	86	88	89	95	99
56	103210	32	no		no		119	117	108	109	110	112	110	110	109	116	62	60	59	60	68	79	77	76	76	84	100
57	1023662	32	no		no		102	110	106	104	98	112	116	122	125	118	64	70	77	72	90	80	85	92	90	99	99
58	1018080	52	no		no		88	76	79	85	74	101	113	118	117	105	55	64	65	66	69	70	80	83	83	81	100
59	1000580	40	no		no		98	96	90	92	93	113	112	110	120	122	78	80	78	80	78	90	91	89	93	93	100
60	976111	56	no		no		86	88	82	88	86	140	148	130	126	120	88	88	80	78	80	105	108	97	94	93	100
61	996263	44	no		no		62	78	78	80	88	110	130	140	130	136	70	80	90	88	80	83	97	107	102	99	96
62	863428	48	no		no		66	72	79	86	82	114	126	121	126	127	73	78	83	72	85	87	94	96	90	99	99
63	1079063	24	yes		no	saturation drop below 90%	88	110	100	98	92	124	126	121	112	122	79	78	83	72	85	94	94	96	85	97	99
64	1038387	40	yes		no	saturation drop below 90%	100	104	110	98	94	122	127	130	133	147	72	84	66	84	90	89	98	87	100	109	99
65	1040219	48	yes		no	saturation drop below 90%	72	98	100	92	94	133	144	149	144	130	87	98	90	87	88	102	113	110	106	102	98
66	768254	40	yes		no	saturation drop below 90%	88	89	84	83	81	130	115	17	103	101	70	67	62	56	54	90	83	47	72	70	96
67	920940	48	no		no		115	117	110	111	100	117	118	115	113	123	72	72	74	68	79	87	87	88	83	94	100
68	934265	40	no		no		85	81	83	77	70	115	123	128	118	128	78	87	86	83	87	90	99	100	95	101	99
69	495380	32	no		no		98	100	102	92	90	130	137	140	128	120	78	72	90	70	72	95	94	107	89	88	99
70	839966	32	yes		no	saturation drop below 90%	70	98	88	90	90	132	138	150	140	136	96	90	90	90	88	108	106	110	107	104	98
71	1036629	16	no		no		87	78	76	72	74	132	122	125	127	120	80	74	88	86	83	97	90	100	100	95	99
72	1064771	40	yes		no	saturation drop below 90%	78	100	102	100	98	130	132	132	127	129	78	88	83	87	83	95	103	99	100	98	100
73	814004	28	no		no		62	78	88	76	70	110	120	128	126	120	66	88	90	88	82	81	99	103	101	95	99
74	484198	32	no		no		85	81	83	77	70	115	123	128	118	128	78	87	86	83	87	90	99	100	95	101	99
75	1077869	32	yes		no	saturation drop below 90%	70	102	90	88	78	122	122	118	118	122	80	76	80	72	80	94	91	93	87	94	98
76	1023396	24	yes		no	saturation drop below 90%	70	78	80	80	72	152	142	140	136	134	98	92	88	80	86	116	109	105	99	102	96
77	713176	56	no		no		88	90	98	92	94	142	144	133	126	122	90	98	87	79	79	107	113	102	95	93	98
78	1024831	40	yes		no	saturation drop below 90%	100	88	87	99	90	102	107	110	99	112	64	69	65	64	72	77	82	80	76	85	100
79	1210219	24	no		no		101	102	110	101	98	122	110	114	119	112	76	79	73	83	75	91	89	87	95	87	99
80	192760	32	no		no		98	99	100	92	80	120	122	127	124	117	88	65	86	78	72	99	84	100	93	87	99
81	4336	56	yes		no	saturation drop below 90%	98	100	100	110	100	150	150	158	148	148	92	98	100	98	96	111	115	119	115	113	98
82	888776	48	no		no		87	95	96	99	88	148	153	150	143	130	100	98	102	81	90	116	116	118	102	103	100
83	484198	44	no		no		88	82	88	86	88	130	128	130	132	130	80	70	80	86	80	97	89	97	101	97	99
84	1029609	56	no		no		88	90	100	103	100	148	150	130	120	130	92	90	88	78	80	111	110	102	92	97	98
85	1026153	36	yes		no	saturation drop below 90%	82	98	98	100	102	130	140	138	142	140	70	90	90	98	90	90	107	106	113	107	99
86	1068942	48	yes		no	saturation drop below 90%	89	106	110	100	92	129	149	144	135	137	87	103	98	83	92	101	118	113	100	107	96
87	103866	48	yes		no	saturation drop below 90%	101	100	98	92	100	140	138	136	138	140	90	95	88	90	98	107	109	104	106	112	98
88	1091982	28	yes		no	saturation drop below 90%	90	108	100	90	92	132	138	130	130	128	88	88	90	88	88	103	105	103	102	101	96
89	1093251	48	yes		no	saturation drop below 90%	88	98	90	88	90	132	140	132	128	120	88	80	78	80	88	103	100	96	96	99	98
90	110945	32	no		no		70	78	80	80	72	140	140	136	144	145	80	100	70	87	92	100	113	92	106	110	99
91	1114681	20	no		no		100	110	97	108	101	122	117	120	125	132	64	64	70	76	78	83	82	87	92	96	100
92	7824	28	yes		no	saturation drop below 90%	76	98	90	81	71	111	119	118	115	108	61	65	68	65	59	78	83	85	82	75	98
93	337556	48	no		no		98	108	96	106	98	122	116	120	122	134	68	70	72	78	80	86	85	88	93	98	100
94	1042808	32	no		no		88	87	87	88	90	131	120	144	149	147	88	74	87	96	90	102	89	106	114	109	100
95	931138	20	no		no		107	105	106	100	102	130	140	138	136	130	80	100	90	88	80	97	113	106	104	97	99
96	1032404	56	yes		no	saturation drop below 90%	92	109	109	98	86	128	13	133	138	132	82	60	67	73	69	97	44	89	95	90	100
97	679712	32	no		no		80	82	84	86	80	127	130	130	129	117	87	87	86	83	84	100	101	101	98	95	100
98	1014468	32	no		no		84	86	88	97	62	110	121	108	109	108	62	85	54	55	79	78	97	72	73	89	100
99	337556	40	no		no		100	110	97	108	101	120	115	118	125	132	64	64	70	76	78	83	81	86	92	96	100
100	1033875	56	yes		no	saturation drop below 90%	98	110	98	90	100	150	152	148	144	148	99	98	90	88	90	116	116	109	107	109	99

S. NO	MRD	SAT5	SAT10	SAT15	SAT20	PHR0	PHR10	PHR20	PHR30	PHR40	PHR50	PHR1	PHR1:10	PHR1:20	PHR1:30	PHR1:40	PHR1:50	PHR2	PSBP0	PSBP10	PSBP20	PSBP30	PSBP40	PSBP50	PSBP1	PSBP1:10	PSBP1:20	PSBP1:30
54	1044680	90	92	98	100	82	84	85	82	80	84	80	114	116	110	95	91	87	122	113	121	114	111	128	118	141	138	135
55	1007346	98	96	96	98	78	80	74	72	70	72	74	100	98	96	98	96	94	128	114	110	116	114	122	122	138	136	136
56	103210	100	100	100	100	84	76	72	77	81	73	70	90	96	91	86	83	78	122	128	127	130	122	130	127	137	134	130
57	1023662	98	98	98	98	82	80	72	76	72	70	74	72	67	68	76	70	86	120	122	113	124	111	120	114	141	137	132
58	1018080	100	100	100	100	88	90	92	90	86	88	86	102	105	99	94	90	87	110	110	102	110	120	108	110	136	132	129
59	1000580	100	100	100	100	100	98	92	90	92	92	98	90	89	88	87	86	87	128	120	116	117	120	124	112	116	118	112
60	976111	100	99	97	97	88	82	86	82	88	80	78	99	103	98	93	89	86	130	132	126	120	140	116	120	128	122	124
61	996263	98	96	98	98	68	62	68	68	70	72	70	83	80	76	78	72	68	110	130	128	130	128	140	130	126	124	120
62	863428	98	97	98	100	95	98	92	94	94	90	88	95	94	92	96	96	94	130	124	131	130	132	134	136	142	140	142
63	1079063	96	90	94	96	83	80	78	76	68	72	74	82	80	76	72	68	62	128	126	129	126	124	128	128	124	120	122
64	1038387	98	90	96	98	92	90	94	88	82	76	78	73	70	68	69	67	65	130	128	127	128	130	128	126	122	124	122
65	1040219	94	90	96	99	98	96	88	86	80	76	70	92	91	90	92	90	90	132	134	137	132	130	132	130	134	136	132
66	768254	90	96	99	99	92	96	90	88	80	86	80	78	75	71	68	64	62	120	128	110	126	120	116	128	116	114	116
67	920940	100	100	100	100	100	98	92	95	98	96	94	95	86	84	89	88	87	120	128	130	130	120	128	126	118	116	116
68	934265	98	99	99	100	70	72	70	68	70	72	70	72	69	68	70	66	62	120	120	122	118	117	120	124	120	118	122
69	495380	99	98	98	99	86	82	74	76	72	70	72	88	89	88	87	87	86	120	110	118	118	120	112	120	122	122	120
70	839966	96	90	94	96	90	92	90	92	88	80	80	76	75	75	74	74	72	130	128	127	126	130	132	122	124	122	122
71	1036629	99	99	99	98	82	80	78	76	72	78	70	80	76	74	72	74	72	112	126	131	126	126	132	122	128	126	124
72	1064771	99	90	94	98	83	80	76	77	78	70	72	76	75	72	70	66	68	126	124	131	122	124	114	128	132	130	130
73	814004	100	100	100	100	68	66	66	68	62	64	62	80	78	78	76	76	74	110	110	112	116	110	106	108	136	136	134
74	484198	98	99	99	100	70	72	70	68	70	72	70	94	95	96	95	94	95	120	120	122	118	117	120	124	128	124	120
75	1077869	90	94	96	98	70	72	70	72	72	74	70	72	86	72	70	66	64	110	118	111	112	112	114	118	116	120	118
76	1023396	90	94	94	99	72	70	70	72	76	78	70	84	80	76	74	70	68	122	126	125	122	120	118	130	124	122	120
77	713176	96	96	96	98	88	82	80	86	84	82	86	64	60	68	90	85	78	128	124	123	130	129	122	124	120	118	122
78	1024831	100	94	90	99	80	88	82	80	88	80	82	82	80	78	74	75	70	116	120	119	110	108	102	112	125	122	120
79	1210219	99	99	99	99	82	88	80	76	70	80	82	64	60	62	86	80	72	110	124	118	114	124	125	120	114	120	110
80	192760	100	100	100	100	88	98	80	76	70	72	70	82	80	78	74	75	76	123	124	127	119	114	112	129	132	134	128
81	4336	96	90	94	100	90	92	90	96	90	88	80	76	72	78	70	68	64	120	122	138	130	130	128	128	128	124	120
82	888776	99	99	99	99	83	88	82	86	88	82	80	66	60	64	85	80	76	130	130	128	122	130	128	126	121	120	117
83	484198	99	98	99	99	70	72	70	74	76	70	72	84	86	86	85	84	83	130	128	120	110	110	116	120	136	138	134
84	1029609	98	96	98	99	92	90	94	90	88	86	82	70	64	68	64	68	62	132	130	128	128	128	126	124	120	118	114
85	1026153	98	90	96	98	82	86	90	92	98	92	96	83	84	84	80	83	78	128	122	130	128	126	128	120	126	124	124
86	1068942	94	90	94	98	88	86	90	92	98	92	96	75	76	74	75	76	78	126	124	129	128	126	132	130	135	134	132
87	103866	96	90	94	96	83	86	88	99	90	94	92	76	72	68	62	66	60	122	120	122	120	130	133	130	126	123	126
88	1091982	96	90	94	98	90	92	80	80	80	78	76	73	69	65	66	64	65	120	116	121	122	128	126	118	124	128	132
89	1093251	96	90	96	98	92	90	88	88	80	86	80	83	82	81	81	80	80	120	120	121	118	122	120	122	128	126	126
90	110945	98	96	98	98	72	70	70	72	76	78	70	69	72	68	65	62	60	138	136	136	136	130	132	130	128	130	126
91	1114681	99	99	100	100	102	103	95	98	93	94	90	68	64	66	65	64	66	123	121	120	119	120	128	128	130	132	134
92	7824	92	90	98	98	83	87	88	80	82	78	78	81	78	73	69	72	66	110	128	126	122	126	114	120	118	114	116
93	337556	99	99	100	100	100	104	96	99	92	95	92	78	72	66	62	66	86	120	122	120	118	116	124	128	126	123	119
94	1042808	100	99	99	100	88	90	92	94	96	90	92	70	68	66	65	65	64	130	130	135	130	127	130	129	124	124	122
95	931138	99	99	99	99	98	92	90	88	80	80	78	90	86	88	82	80	80	128	120	130	126	128	128	120	140	140	138
96	1032404	100	92	90	98	94	95	97	99	95	100	90	70	68	64	62	64	65	128	130	129	134	128	126	128	120	122	120
97	679712	100	100	100	100	83	80	82	80	84	80	78	99	96	95	96	94	97	112	128	126	125	120	114	116	132	130	130
98	1014468	100	100	100	100	88	80	82	84	86	87	88	71	75	70	68	64	62	120	122	125	124	130	128	126	118	120	118
99	337556	99	99	100	100	102	103	95	98	93	94	90	82	80	83	82	80	81	120	121	119	117	118	120	126	128	128	126
100	1033875	90	94	96	98	88	86	82	80	86	88	84	90	83	74	69	70	66	138	136	131	130	128	130	131	122	126	124

S. NO	MRD	PSBP1:40	PSBP1:50	PSBP2	PDBP0	PDBP10	PDBP20	PDBP30	PDBP40	PDBP50	PDBP1	PDBP1:10	PDBP1:20	PDBP1:30	PDBP1:40	PDBP1:50	PDBP2	PMAP0	PMAP10	PMAP20	PMAP30	PMAP40	PMAP50	PMAP1	PMAP1:10
54	1044680	131	127	123	71	77	77	75	78	76	72	84	81	78	76	74	71	88	89	91	88	83	84	86	103
55	1007346	135	134	132	78	70	71	79	73	77	72	76	74	72	70	72	71	94	85	83	89	87	91	89	96
56	103210	127	125	123	78	61	68	71	72	74	72	98	96	94	92	90	88	93	83	87	88	89	86	90	111
57	1023662	128	124	121	88	70	73	82	70	84	70	94	90	88	86	83	81	99	87	86	96	84	95	85	109
58	1018080	126	122	118	62	68	70	60	61	67	60	90	87	85	83	81	80	78	82	81	76	82	81	76	105
59	1000580	120	122	124	80	80	88	78	79	79	78	98	96	97	96	95	94	96	93	97	91	93	95	90	104
60	976111	126	122	124	82	88	78	80	87	79	78	94	92	90	87	84	81	98	102	94	93	105	91	92	106
61	996263	116	120	118	70	80	90	88	89	89	88	74	71	70	68	66	70	83	96	102	102	102	106	102	92
62	863428	136	130	132	70	72	68	76	78	72	74	80	77	68	70	70	77	90	89	88	94	96	93	95	100
63	1079063	120	118	116	78	88	83	88	73	85	80	72	70	68	66	64	62	95	100	98	98	89	98	95	89
64	1038387	128	126	124	88	85	88	87	83	80	78	68	66	64	60	62	64	102	99	100	98	99	95	93	86
65	1040219	130	128	124	88	83	86	80	85	84	87	78	75	76	76	75	74	102	100	103	95	99	99	101	96
66	768254	112	108	110	80	88	78	88	79	87	82	80	79	76	74	72	70	93	101	88	100	93	97	97	92
67	920940	114	114	112	88	70	80	86	79	81	84	58	60	58	58	60	60	98	89	96	101	94	97	98	78
68	934265	120	118	116	80	82	84	80	87	81	80	60	62	60	62	78	76	93	94	97	92	97	94	95	80
69	495380	120	126	120	88	78	82	78	71	87	72	72	72	70	70	69	69	98	88	94	91	87	95	88	88
70	839966	120	118	120	86	88	80	76	70	88	80	69	70	72	70	70	72	100	101	95	90	90	103	93	88
71	1036629	128	122	122	74	86	87	80	80	80	78	78	76	76	74	76	74	86	99	101	93	95	96	93	95
72	1064771	129	128	128	88	78	80	80	80	75	85	82	68	64	64	65	66	100	93	96	94	95	87	98	98
73	814004	134	135	136	70	80	72	88	79	81	70	82	80	80	82	80	82	83	90	85	97	89	89	82	100
74	484198	118	118	120	80	80	80	80	87	81	80	78	79	78	78	76	76	93	93	94	92	98	94	95	94
75	1077869	116	114	116	70	78	80	74	78	82	80	74	72	70	68	64	62	83	91	90	84	88	93	93	88
76	1023396	118	116	114	80	78	88	82	88	78	82	88	86	84	82	80	79	94	94	100	93	99	90	97	100
77	713176	118	120	118	88	87	83	82	87	74	79	80	72	78	76	74	70	101	99	96	98	100	90	93	93
78	1024831	118	116	114	70	80	88	84	68	78	82	80	78	80	76	74	72	85	93	98	90	80	85	91	95
79	1210219	109	126	120	78	78	72	80	85	83	84	72	74	72	70	72	74	88	93	87	89	97	96	95	86
80	192760	124	126	130	88	79	87	74	76	68	83	70	72	72	68	66	68	99	94	100	89	89	83	98	90
81	4336	118	120	112	80	82	84	76	79	77	80	72	70	68	66	68	70	93	95	102	94	96	94	96	91
82	888776	114	112	110	78	80	76	80	77	87	70	70	68	66	64	66	68	95	95	93	94	95	101	88	87
83	484198	130	128	126	80	80	70	88	77	87	80	78	74	74	72	72	74	96	96	86	95	88	97	93	97
84	1029609	118	128	126	78	76	78	80	77	79	78	72	78	68	70	68	70	96	94	95	96	95	95	93	88
85	1026153	122	122	120	90	88	90	88	85	89	88	72	70	70	72	71	72	102	99	103	101	99	103	98	90
86	1068942	134	130	128	78	90	88	82	88	80	76	86	84	82	84	80	82	94	101	101	95	101	96	93	102
87	103866	122	120	118	78	85	80	66	73	71	73	63	62	61	63	65	63	92	96	94	84	92	93	92	84
88	1091982	135	129	128	80	76	82	80	80	70	76	80	79	76	73	75	73	93	89	94	94	95	89	89	95
89	1093251	124	126	120	88	70	78	78	80	78	88	68	68	66	68	68	66	98	86	92	89	93	92	98	88
90	110945	121	119	117	70	74	76	80	87	85	82	75	73	71	68	70	68	92	94	96	99	101	101	98	93
91	1114681	130	128	128	74	70	72	72	80	88	78	94	96	96	94	92	92	90	87	88	85	93	100	95	106
92	7824	114	115	110	78	72	84	74	74	76	80	86	82	80	76	74	75	8	91	98	90	91	89	93	97
93	337556	123	120	117	72	76	70	70	87	81	77	84	82	80	79	76	75	88	91	87	86	97	95	94	98
94	1042808	120	122	120	96	92	83	86	86	87	83	74	75	74	74	72	70	107	105	100	100	100	101	98	90
95	931138	136	134	134	88	78	80	70	71	73	80	85	84	80	82	80	80	101	92	96	88	90	91	93	103
96	1032404	126	122	118	68	70	72	74	78	80	85	72	70	72	70	68	69	88	90	90	94	95	95	98	88
97	679712	128	128	126	70	66	70	84	71	69	71	80	79	75	72	70	75	84	86	88	98	87	85	83	97
98	1014468	124	119	116	78	62	58	64	68	70	66	64	62	60	68	68	65	92	82	80	84	89	88	85	82
99	337556	125	126	127	78	70	72	70	79	87	78	75	74	72	70	70	68	92	87	88	85	93	98	94	93
100	1033875	124	128	124	90	86	88	82	76	78	78	81	79	78	76	74	72	106	102	102	98	93	95	96	94

S. NO	MRD	PMAP1:20	PMAP1:30	PMAP1:40	PMAP1:50	PMAP2	PSAT0	PSAT10	PSAT20	PSAT30	PSAT40	PSAT50	PSAT1	PSAT1:10	PSAT1:20	PSAT1:30	PSAT1:40	PSAT1:50	PSAT2	Patients satisfaction score
54	1044680	100	97	94	92	88	100	100	100	100	100	100	100	99	98	100	100	100	100	3
55	1007346	95	93	92	93	92	98	99	99	99	99	99	99	99	98	100	100	100	100	4
56	103210	108	106	103	102	99	98	98	98	98	99	99	99	99	98	100	100	100	100	4
57	1023662	105	103	100	96	94	99	99	99	99	99	99	99	99	98	100	100	100	100	4
58	1018080	102	99	97	95	93	99	98	99	99	99	99	99	99	98	100	100	100	100	4
59	1000580	103	102	104	104	104	100	100	100	100	100	100	100	99	98	100	100	100	100	4
60	976111	102	102	100	97	96	98	98	99	98	98	98	98	99	98	100	100	100	100	3
61	996263	88	87	84	84	86	96	98	96	98	98	96	98	99	98	100	100	100	100	4
62	863428	98	93	92	90	95	99	100	100	100	100	100	100	99	98	100	100	100	100	3
63	1079063	87	86	84	82	80	99	99	99	99	99	99	99	99	98	100	100	100	100	3
64	1038387	86	83	83	83	84	99	99	99	99	99	99	99	99	98	100	100	100	100	4
65	1040219	95	95	94	93	90	99	99	99	99	99	99	99	99	98	100	100	100	100	3
66	768254	91	90	86	84	83	96	96	98	96	98	98	98	99	98	100	100	100	100	4
67	920940	78	77	76	78	77	99	99	99	99	99	99	99	99	98	100	100	100	100	3
68	934265	81	80	81	92	90	100	100	100	100	100	100	100	99	98	100	100	100	100	4
69	495380	88	87	86	88	86	99	99	99	99	99	99	99	99	98	100	100	100	100	4
70	839966	87	88	87	86	88	99	99	98	98	99	99	99	99	98	100	100	100	100	3
71	1036629	92	92	92	91	90	99	99	99	99	99	99	99	99	98	100	100	100	100	4
72	1064771	88	86	85	86	87	99	100	100	100	100	100	100	99	98	100	100	100	100	3
73	814004	98	98	99	98	100	99	98	100	100	99	100	100	99	98	100	100	100	100	3
74	484198	94	92	91	90	90	100	100	100	100	100	100	100	99	98	100	100	100	100	4
75	1077869	88	86	84	80	80	98	98	98	98	98	98	98	99	98	100	100	100	100	4
76	1023396	98	96	94	92	90	98	96	98	98	98	98	98	99	98	100	100	100	100	3
77	713176	87	92	90	89	86	98	98	99	100	100	100	100	99	98	100	98	98	98	4
78	1024831	92	93	90	88	86	99	100	100	100	100	100	100	99	98	100	100	100	100	4
79	1210219	90	84	83	90	89	99	99	99	99	99	99	99	99	98	99	99	99	99	3
80	192760	93	91	86	86	88	98	99	99	99	99	99	99	99	98	99	99	99	99	4
81	4336	88	85	83	85	84	98	98	98	98	98	98	98	99	98	99	99	99	99	4
82	888776	85	83	80	81	82	98	99	100	100	100	100	100	99	98	99	99	99	99	4
83	484198	96	94	91	91	91	99	98	98	99	99	99	99	99	99	99	98	98	98	4
84	1029609	91	83	86	88	88	98	98	99	99	99	98	99	99	99	99	98	98	98	3
85	1026153	88	88	89	88	88	98	98	99	98	98	98	98	99	99	99	98	98	98	4
86	1068942	100	98	100	96	97	98	99	98	98	98	99	99	99	99	99	99	99	99	4
87	103866	83	83	83	83	82	98	99	99	100	100	100	100	99	99	99	98	98	98	4
88	1091982	95	95	94	93	91	98	98	98	98	98	98	98	99	99	99	99	99	99	4
89	1093251	87	86	87	87	84	98	98	98	98	98	98	98	99	99	98	99	99	99	3
90	110945	92	90	85	86	84	98	96	98	98	98	98	98	99	99	99	99	99	98	4
91	1114681	108	108	106	104	104	99	100	100	100	100	100	100	99	99	99	99	99	98	4
92	7824	93	92	88	88	87	98	98	98	98	98	100	100	99	99	98	98	98	98	4
93	337556	96	93	94	91	89	99	100	100	100	100	100	100	99	99	99	98	98	98	4
94	1042808	91	90	90	88	86	100	100	100	100	100	100	100	99	98	99	98	98	98	4
95	931138	103	99	100	98	98	96	99	99	99	99	99	99	99	98	99	99	99	99	4
96	1032404	88	88	88	86	85	99	99	100	100	100	100	100	99	98	99	99	99	99	4
97	679712	96	93	90	89	92	100	100	100	100	100	100	100	99	98	99	98	98	98	3
98	1014468	81	80	87	85	82	99	100	100	100	100	100	100	99	100	100	100	100	100	4
99	337556	92	90	88	88	87	99	100	100	100	100	100	100	99	99	99	99	99	99	4
100	1033875	95	93	92	92	89	98	98	98	98	98	98	98	99	99	99	99	99	99	3

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Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 22.01.2021 has approved the plan of thesis of **Dr. Upasana**, a student of your college for **MD Anaesthesiology** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis

Comparison of oxygenation using venturi mask and high flow nasal cannula in patients undergoing minor surgery under total intravenous anaesthesia

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The student has to submit the three copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

S P Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

1. ***If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.***
2. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

COMPARISON OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

Doctor of Medicine

in

ANAESTHESIOLOGY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

NOVEMBER, 2019

Dr. UPASANA

DEPARTMENT OF ANAESTHESIOLOGY
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ABSTRACT OF PLAN OF THESIS

Title	COMPARISON OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA
For the degree of	M.D. Anaesthesia
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Introduction: High -flow nasal oxygen (HFNO) is relatively new technique that is being increasingly used in ICUs. Its role in operating room is successfully appearing in anaesthesia for minor airway surgeries and as an alternative method for pre-oxygenation. Its role in apnoeic oxygenation has also been highlighted in few studies. In anaesthesia practice oxygen is routinely supplemented to all patients regardless of depth of sedation being administered. Hypoxia is main concern in patients under sedation/ anaesthesia because of hypoventilation and airway obstruction. We hypothesize that the use HFNO as method of oxygenation in patients undergoing minor surgery would increase the margin of safety in patients with maintained spontaneous respiration under total intravenous anaesthesia (TIVA).

Aims & objectives: Our aim is to compare the effect of high flow nasal oxygenation with low flow nasal oxygenation in patients undergoing minor surgery under total intravenous anaesthesia.

Materials & Methods: A randomized prospective study will be conducted on 100 patients of ASA I, II scheduled to undergo minor surgery under total intravenous anaesthesia. Patients will be randomly allocated into two groups. Group H will receive heated and humidified high flow nasal oxygen via AIRVO at a rate of 50-L/minute (FiO_2 0.5) and Group V will receive cold and dry low flow nasal oxygen via venturi mask at the rate of 6 L/minutes (FiO_2 0.5).

Clinical significance: This study will help us to find out the a better and preferable way of oxygenation in non intubated patients undergoing minor surgery under total intravenous anaesthesia.

Keywords: High Flow Nasal Oxygen, Low Flow Nasal Oxygen

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Candidate	Co-supervisor	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"COMPARISON OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA"** exist in the Department of Anaesthesiology at Dayanand Medical College and Hospital, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate herself under our supervision and guidance.

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4	DATE OF ADMISSION OF COURSE	17th May 2019
5	TITLE OF THE TOPIC	COMPARISON OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA.

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

High flow nasal Cannula (HFNC) has been shown to benefit oxygenation, ventilation and upper airway patency in a range of clinical scenarios in ICUs in both apnoeic patients and spontaneously breathing patients.[1-2] But the use of HFNC in spontaneously breathing patients undergoing minor surgery under TIVA (Total intravenous anaesthesia) has not been previously described. These minor surgeries are of shorter duration and allow patient discharge from hospital on the day of surgery. Minor/ambulatory surgeries have expanded far beyond performing the simple procedures on healthy patients. Currently, a broad range of procedures are performed in patients who frequently have pre-existing medical conditions.[3] Minor surgery requires the same basic standards as inpatient major surgery in terms of facilities required, perioperative monitoring, anaesthetic management and resuscitation. The choice of anaesthetic drugs and technique should enable appropriate and controllable intraoperative conditions. General anaesthesia commonly remains the most popular technique among patients, surgeons and anaesthesiologists. Patients undergoing minor to intermediate surgery using a TIVA technique may sometimes receive oxygen through a simple Hudson-type face mask. This method of oxygen supplementation may not be sufficient to prevent hypoxia. Moreover, cold and dry oxygen is intolerable to patients [1]. The depth of sedation required during minor/ambulatory procedures is almost similar to general anaesthesia and, airway remains largely unprotected.

Choice of anaesthesia given to patients undergoing minor surgeries commonly includes propofol, because of its faster onset and offset of action. The short context-sensitive half-time, with short effect-site equilibration time makes this a readily titratable drug for IV sedation.[4-6] As propofol alone does not relieve acute nociceptive pain thus, it is usually co-administered with IV fentanyl and/or ketamine to provide analgesia. Addition of ketamine to propofol has several benefits because of hemodynamic stability, lack of respiratory depression, good

recovery and post procedural analgesia. A direct effect increases cardiac output, arterial blood pressure, heart rate and central venous pressure.[7] Ketamine provides excellent anaesthesia induction and maintainence.[8,9] This IV analgo-sedation is usually maintained with preserved spontaneous breathing.

Studies have shown that deep sedation/anaesthesia reduces functional residual capacity (FRC) even with preserved spontaneous breathing. Functional residual capacity (FRC) is the most important store of oxygen in the body. The greater the FRC, the longer apnoea can be tolerated before critical hypoxia develops. The alveolar fraction of oxygen (FAO_2) is about 0.13 when breathing air. For an adult with a normal FRC and VO_2, the oxygen content of the lungs will be consumed within ~1 min (≈290 ml). This explains why critical hypoxia can be expected after 1 min of apnoea.[10] Patients with reduced FRC reach critical hypoxia more rapidly. There is decrease in minute ventilation (MV) as a result of decrease in respiratory rate or tidal volume (VT) or both, causing carbon dioxide retention. There is a mismatch between alveolar ventilation (Va) and perfusion (Q), leading to an increasing shunt fraction and hypoxia.[11] This respiratory insufficiency can further precipitate cardiovascular insufficiency. Sympathetic activation in response to hypoxemia increases heart rate, and myocardial workload, and in the setting of pre-existing heart disease, it can even precipitate arrhythmias and myocardial ischemia.

Maintaining oxygen saturation is very crucial to successful outcome. Routine oxygen supplementation should be provided to all patients undergoing sedation, irrespective of its depth.[12] Oxygen is generally supplemented via Venturi mask or by using Magill circuit. To deliver FiO_2 of 0.5, oxygen is delivered at flow rates of 6 l/minute. . The oxygen so delivered is cold and dry, and has irritating effect on nasal mucosa.[13]

To overcome these limitations and to increase margin of safety we propose the use of high flow nasal oxygen for oxygenation (HFNO). HFNO allows delivering of oxygen at a rate of 20-60L/minute, at 37 degree Celsius with an absolute humidity of 44 mg H2O/L, and FiO_2 of

up to 100%. High flow of nasal oxygen allows lesser mixing with room air, generates reservoir of oxygen that minimizes CO_2 rebreathing, reduces dead space, creates PEEP and improves alveolar ventilation. This warm, humidified inspiratory gas is better tolerated by patients. In our study we will be using the device AIRVO to deliver HFNO. HFNO has been increasingly used in ICU's to treat hypoxemia in critically ill patients, and has been proved superior, but its role has not been explored for oxygenation in patients undergoing minor surgery under total intravenous anaesthesia in operating room.[1]

In our study, we plan to compare the effect of Venturi mask and HFNC in terms of oxygen saturation, changes in heart rate, blood pressure and the incidence of airway obstruction.

6.2REVIEW OF LITERATURE

Oxygen delivery devices can be classified into low flow or variable performance and high flow or fixed performance devices.

LOW FLOW OXYGEN DELIVERY SYSTEMS

These are variable performance devices, i.e. their performance gets changed with the changes in patient respiratory parameters. As their output varies, they are less accurate and less reliable in terms of oxygen delivery. The rate and depth of breathing determines the oxygen concentration (FiO_2) and is mostly not fixed. Fast and deep breathing results into lower FiO_2 because it draws more room air into lungs and thus dilutes the inspiratory gases and oxygen concentration.

Low flow oxygen delivery devices include:

Nasal Cannula

Simple Mask

Partial Rebreather Mask

Non – Rebreather Mask

HIGH FLOW OXYGEN DELIVERY DEVICES

High flow oxygen delivery devices will provide a fixed FiO_2 (0.24-1.0) regardless of the patients/client's inspiratory demands. Examples of high flow devices include:

Air entrainment mask (Venturi - mask)

Air entrainment nebulizer

Nasal High flow oxygen therapy

Mechanical ventilators

VENTURI MASK: The Venturi mask is commonly used for oxygen delivery. Oxygen is delivered at high velocity through a small orifice, and the shear forces lead to mixing of room air. FiO_2 can be adjusted using adjustable mask adopters by varying its different orifice size. The flow of gas delivered to the patient always exceeds minute ventilation, which prevents entrainment of room air around the mask and dilution of oxygen. To increase FiO_2 flow rates has to be increased and maximum FiO_2 that can be delivered is 0.5 with flow rate of 6L/min. The

humidification of inhaled gas remains problematic because of insufficient humidification of oxygen by standard bubble humidifiers.[14]

HIGH FLOW NASAL OXYGEN THERAPY

It is an innovative high flow system that allows for delivering up to 60Litres/min of heated and humidified gas with FiO_2 ranging between 21%-100%. FiO_2 adjustments are independent of the setting flow rate, which is set above the patient's maximum inspiratory flow rate, to administer heated and humidified high flow oxygen to the patients.

HFNO can adequately supplement oxygen, support the respiratory system and hydrate the airways effectively. FiO_2 values administered via HFNO are more stable and higher than those standard oxygen delivery systems because HFNO can generate high flow rate up to 60L/min, which can match or even exceed the patients inspiratory flow demand, thus reducing the entrainment of room air and dilution of administered oxygen. In addition, these high flow rates create a positive airway pressure which linearly correlates with the administered flow rate. For every 10L/min increase in gas flow, the mean airway pressure increases by 0.69cm H2O in the mouth closed position and 0.35 cm H2O in the mouth open position. Analysis of pressure generated during different parts of respiratory cycles demonstrated that higher pressure is generated during expiration than inspiration, which is flow dependent. This mechanism resembles application of PEEP and it causes recruitment of atelectatic areas and thus increases of end expiratory lung volume ~ 25%. Lung compliance increases and patient breathes more slowly, with almost 10% higher tidal volumes. [1,15,-19]

High flow generates a reservoir of oxygen that minimizes CO2 rebreathing, reduces dead space and increases the alveolar ventilation. HFNO is associated with the generation of positive airway pressure that ranges from 2.7 and 7.4cm of H2O. The degree of pressure generated depends on flow rates, geometry of the upper airway, nose or mouth breathing, and the size of cannula in relation to the nostrils. Warmed and humidified air reduces the viscosity of the tracheobronchial secretions, enhances the muco-ciliary clearance, reduces dryness of the upper airways and improves patient comfort.[1]

Studies comparing the effects of HFNO and Face mask as preoxygenation method have shown conflicting results. Jean-Luc Hanouz et al in 2019 conducted a study comparing High flow nasal oxygen for preoxygenation against face mask and found that pre oxygenation with HFNO is not a reliable method of pre-oxygenation before induction of anaesthesia.

Lu Z et al in 2019 represented a meta-analysis of the effect of high - flow nasal cannula (HFNC) oxygen therapy compared with conventional oxygen therapy in post-operative patients and concluded that HFNC significantly reduced the reintubation rate and rate of escalation of respiratory support in post-extubated surgical patients compared with conventional oxygen therapy, which proves better oxygenation capacity of HFNO.

Roman et al conducted a retrospective study on 238 patients undergoing ERCP (Endoscopic retrograde cholangiopancreatography) and EUS (Endoscopic ultrasound). They concluded that high flow nasal oxygen availability was associated with improved oxygenation and utilization of general anaesthesia.

High Flow nasal cannula (HFNC) is representative of next generation oxygen device that carries unique advantage in augmenting respiratory function along with oxygenation. It has great potential for utilisation in procedures requiring analgo-sedation. Not much evidence is available regarding use of HFNC; further studies are needed to determine the specific population that will benefit from HFNC while receiving intravenous propofol sedation and in comparison with conventional oxygen therapy. This study aims to find the same.

6.3 AIMS AND OBJECTIVES OF THE STUDY

Comparison of Oxygenation using Venturi mask and high flow nasal cannula in patients undergoing minor surgery under total intravenous anaesthesia.

7. MATERIALS AND METHODS

7.1 SOURCE OF DATA

A randomised interventional study will be conducted in the Department of Anaesthesiology, DMC& H, Ludhiana, after approval from institutional ethics committee on a total of 100 patients undergoing minor surgery. Patients will be randomly allocated in two groups of 50 patients each, by computer generated randomisation codes contained in sealed, sequentially numbered envelopes. A written informed consent will be obtained from each patient.

7.2 METHOD OF COLLECTION OF DATA

A total of 100 patients of ASA physical status I & II, scheduled to undergo minor surgery, will be taken up for this study.

Group allocation:

Patient will be randomly allocated to either of two groups of 50 patients each, based on oxygenation technique used during total intravenous anaesthesia for minor surgery as follows:

GROUP H: comprising of 50 patients, who will receive high flow nasal oxygen using AIRVO at the rate of 50L/minute at 0.5 FiO_2

GROUP V: comprising of 50 patients, who will receive oxygen via Venturi mask at the rate of 6L/minute at 0.5 FiO_2.

Inclusion criteria

1) Age=>18yrs
2) ASA I & II
3) Patients with BMI <40kg/m^2
4) Patients undergoing elective minor surgery (of duration <60 minutes) under TIVA without intubation.

Exclusion criteria

1) Morbid obese patients (BMI>40kg/m^2)
2) Patients having pre procedure saturation <90%
3) Psychiatric / neurological diseases
4) Allergy to drugs used in general anaesthesia
5) Severe renal, hepatic, cardiac or respiratory diseases
6) Patients with anatomical facial/nasal/airway abnormality/trauma

7) Patients' refusal of consent

To compensate for dropouts at later stage, we will recruit 10% more case in each group.

ANAESTHESIA TECHNIQUE

Pre anaesthetic examination comprising of detailed history, physical, systemic examination and routine baseline preoperative investigations, will be done in every case. A detailed preoperative airway assessment will be done including mouth opening, neck movements, presence of buck teeth, thyro-mental distance and Mallampati grading to anticipate difficult airway. Informed consent will be obtained from each patient prior to the start of the procedure using approved anaesthesia consent form.

All the patients will be kept nil orally for at least 6 hours prior to procedure. On shifting patient in the operating room, standard-of-care monitoring of vital signs using multi- parameter patient monitoring including pulse-oximetery, heart rate, non-invasive blood pressure measurement and continuous ECG monitoring, will be started and base line values will be recorded. Intravenous access will be secured. Patients will be pre oxygenated for 3 minutes using venturi mask or high flow nasal cannula according to allocated groups. Patients will be premedicated with Inj. glycopyrrolate 0.2mg IV, Inj. ondansetron 4mg IV and IV fentanyl citrate 2 mcg/kg body weight and midazolam 1mg intravenously.

Anaesthesia will be induced using a mixture of ketamine and propofol (Ketofol solution). This ketofol solution will be prepared using ketamine and propofol in ratio of 1:2 i.e. 2 ml (100 mg) of ketamine added to 20 ml (200mg) of 1% propofol, making total of 22 ml, such that 1 ml of this ketofol contains 4.55 mg of ketamine and 9.09 mg of propofol. Loading dose of Inj. ketofol (0.2 ml/kg body weight) will be given IV slowly, titrated to the loss of response to verbal commands. Oxygenation will be continued throughout the procedure using venturi mask or high flow nasal cannula respectively as per group allocation.

Anaesthesia will be maintained by using intermittent boluses of 2-3 ml of ketofol solution. Additional fentanyl boluses (0.5 microgram/kg) will be given to maintain analgesia if patient develops signs of inadequate analgesia (tachycardia, hypertension, diaphoresis, tachypnoea and patient movement). Continuous monitoring of SpO_2, ECG, Heart rate, non-invasive blood pressure monitoring will be displayed and parameters will be recorded every 5 minutes during the course of the procedure. Total duration of procedure and total consumption of propofol, ketamine and fentanyl will be noted. Number of episodes of hypoxaemia (i.e. SpO_2 less than 90%) will also be recorded.

At any time during the procedure, if oxygen saturation falls below 90% and/or airway obstruction is suspected, airway support manoeuvres, such as performance of chin lifts or jaw thrusts will be done to open the obstructed airway. If oxygen saturation still remains <90% or airway obstruction persists, oral/nasal airway will be inserted. If patient develops apnoea, bag and mask ventilation with 100% oxygen will be started. If there is difficulty in maintaining patent airway or if there is a difficulty in bag and mask ventilation, supraglottic device insertion or intubation will be done as appropriate. Propofol-induced cardiac depression (hypotension and/or bradycardia) will be appropriately treated with incremental doses of inj. ephedrine and /or atropine.

At the end of procedure, full recovery from anaesthesia will be ensured by spontaneously breathing patient, stable haemodynamics, responding to verbal command and sustained head lift. Patients will be then shifted to post anaesthesia care unit and vital parameters will recorded every 10 minutes for next two hour. When patient meets discharge criteria (Modified Aldrete score > 9), he/she will be allowed to be shifted from recovery room to ward.

Patient response for procedural comfort and satisfaction will be dichotomized to favourable (Excellent = 5, Very good = 4, Good = 3) and unfavourable (Fair = 2, Poor = 1).

OUTCOME

Primary outcome

1. Incidence of hypoxia (SpO_2 < 90%)

Secondary outcomes

1. Haemodynamic instability (>20% fluctuation from baseline HR/BP)
2. Need for airway manoeuvres/adjuncts
3. Need for supra-glottic airway device insertion/intubation
4. Patients tolerance of procedure

Statistical Analysis

A post hoc power analysis was conducted using the software package, G Power (Faul and Erdfelder 1992). The alpha level used for this analysis was $p<0.05$ and beta was 0.20. If the post hoc analysis reveals the statistical power of 0.40, it detects a small effect size, whereas if the power exceeds 0.80 it detects moderate to large effect size. By using the parameter oxygen saturation with reference to study. by Schumann R, Natov NS, Rocuts-Martinez KA, Finkelman MD, Phan TV, Hegde SR, et al. High-flow nasal oxygen availability for sedation decreases the use of general anesthesia during endoscopic retrograde cholangiopancreatography and endoscopic ultrasound. World J Gastroenterol. 2016;22:10398–405, which was the primary outcome of our study, Power of the study has been calculated to be 0.93 and with an effect size of 0.37 with 10% chance of error for total sample size 100 i.e. 50each.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

Use of Venturi mask and AIRVO for oxygenation according to allocated group.

7.4 HAS ETHICAL CLEARENCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3 ?

Attached herewith.

LIST OF REFERENCES

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PROFORMA

Serial No: _____ Date: _____

MRD No: _____ Group: _____

Patient initial : _____ Age (Yrs): _____ Gender: M / F

Phone No: _____ Address: _____

ASA Physical Status: I / II BMI: _____

Height (m): _____ Weight (kg): _____

AIRWAY: Dentition Mallampati Class Neck movement

Thyromental distance Mouth opening Neck circumference

Diagnosis: _____

Procedure: _____

Procedure time: _____ to _____ Duration: _____

Baseline Vitals: HR: _____ SpO_2: _____

BP Systolic: _____ Diastolic: _____ Mean: _____

Premedication:	Drug:	Route:	Time:
	Inj. Glycopyrrolate 0.2mg	_____	_____
	Inj. Ondansetron 4mg	_____	_____
	Inj. Fentanyl citrate _____µg	_____	_____
	Inj Midazolam	_____	_____

Induction dose of Ketofol (ml) _____

Containing Ketamine(mg) _____ Propofol (mg) _____

Pre-oxygenation: Device: _____ Oxygen flow rate: _____

Total Fentanyl : _____ Total Propofol: _____ Total ketamine: _____

Need for airway manoeuvrability: Yes / No Manoeuvre: _____

Need for airway adjunct: Yes / No Device: _____

Need for supraglottic device/intubation: Yes / No Reason: _____

Complications:	Event	Management	Outcome
	_____	_____	_____

Signature of Candidate

Signature of Supervisor

Intraoperative Parameters

Time	Intermittent drug		Heart Rate	Systolic BP	Diastolic BP	Mean BP	SpO_2	Seda Sco
Baseline	Drug	Dose						

Post Procedure parameters

Time(Min)	Heart Rate	Systolic BP	Diastolic BP	Mean BP	SpO_2	Aldrete Score

Patient satisfaction score: 1 2 3 4 5

Shifting time from recovery:

Signature of Candidate

Signature of Supervisor

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o..... am willing to participate in the study **"COMPARISON OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

....

Signature of the Witness Signature of the patient

Name:

Signature of Supervisor **Signature of Candidate**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य **"COMPARISON OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"COMPARISON OF OXYGENATION USING VENTURI MASK AND HIGH FLOW NASAL CANNULA IN PATIENTS UNDERGOING MINOR SURGERY UNDER TOTAL INTRAVENOUS ANAESTHESIA" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਚੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ